

SCHOOL BASED ENVIRONMENTAL EDUCATION
IN NEW ZEALAND: CONCEPTUAL ISSUES
AND POLICY IMPLICATIONS.

VOLUME ONE: TEXT

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ABSTRACT

Despite rapid uptake overseas environmental education has received no formal commitment from the New Zealand education system. This study is a multidisciplinary examination of four key questions that are considered to frame the implications of environmental education for educational policy in New Zealand, now. Findings are considered to have international implications.

The four questions are these:

- what exactly is environmental education?
- what are the implications of present understanding in the field of curriculum studies?
- what are the environmental problems that should form the basis for a N.Z. programme?
- what are the implications of existing curriculum structure and classroom practice?

The first two questions are examined by means of literature reviews and the second two by experimental studies.

Environmental education is found to be a widely misunderstood and mis-taught philosophy intended to be a progressive, process dominated problem solving strategy. Experiences recorded in curriculum studies suggest that it is normal for centrally planned curriculum innovations to be ignored or re-invented. Factors contributing to failures in the dissemination of curricula are recorded. A social survey of expert environmental managers reveals the problems to which a N.Z. programme should be directed. It also suggests that environmental education is moral education. Existing classroom practice is found to be traditional and content dominated. The substantial

gap between the culture of the innovation and the culture of the conventional classroom is considered to be the major source of implementation failures.

In a cross-disciplinary synthesis of results from the four studies, four policy implications are identified:

- a political commitment is required because environmental education involves a change to accepted social views of the purposes of schooling;
- the communicability of the Unesco/UNEP model needs to be improved. Teachers do not understand it. An improved model is proposed;
- dissemination of environmental education requires a shift from R, D and D to S.I. models and away from Science as a vehicle; and,
- questions to do with pedagogical viability need resolution.

On these grounds it is concluded that it is not possible to recommend the dissemination of the present model of environmental education by standard approaches within New Zealand education.

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CHAPTER ONE

INTRODUCTION

When the Earth is sick
and the animals disappear
the Warriors of the Rainbow will join together
to protect the wildlife
and heal the Earth.

Ancient legend of the North American
Indians.

One of the more significant cultural movements to emerge from the social debate of the 1960s was that of environmentalism. A series of events and perceptions to do with population, resources and the mis-use of the human environment caused Western societies to consider the vulnerability of their human ecology. As the 1960s passed into the 1970s and 1980s, concern for the great social issues shifted to other more immediate problems (Kilbourn, 1981). Environmentalism, however, had coloured by then many of the strands of our cultural heritage. It gave rise to new ways of thinking and working in fields such as planning, law, economics, engineering and architecture. In education, environmentalism found its expression in a philosophy called environmental education.

Environmental education began with the belief that people ought to know more about their ecological foundations, because those foundations were being inadvertently weakened (Brennan, 1964). It evolved to

the point where it is now a complex educational philosophy that defies simple statement. It now raises questions, not only about what teachers should teach, but also about the purpose of schooling in Western societies (Greenall, 1980). To some, environmental education is part of a movement which seeks to change society by first changing schools (Lawton and Prescott, 1976). The Warriors of the Rainbow have come bearing textbooks and chalk as their weapons of battle.

Environmental education spread rapidly, in spite of a growing divergence between people who saw it as information and those who saw it as social reconstruction. Born in America around 1965, environmental education had by 1975 influenced school curricula in at least 296 school districts in the USA (Dissinger and Lee, 1973) and in most other developed countries (Shaffer, 1978). Its progress was greatly enhanced by an international programme for the development and dissemination of environmental education jointly sponsored by Unesco and UNEP. Sixty five countries were represented at the final Unesco/UNEP intergovernmental environmental education conference at Tbilisi, Russia in 1977 (Unesco, 1977).

New Zealand was not represented at Tbilisi, nor at any other world level conference. Currently, New Zealand is one of only a few Unesco member states that has not put into place a formal programme in environmental education. Despite interest in the concept among teachers (NZAEE, 1984) and environmental administrators (Ellis et.al., 1981) no political commitment has been made to the implementation of environmental education. No formal programmes exist within our schools.

2 introduction

The study that follows arises from a research and development programme sponsored by the New Zealand Commission for the Environment and Department of Education. Their financial support for this project is hereby recorded and acknowledged. The material presented here is the research component of that programme. The programme as a whole had the goal of laying a proper foundation for the implementation of environmental education in New Zealand; of moving environmental education out of the hangar and onto the runway, pending instructions to take off. The programme was directed primarily towards issues at the level of national educational policy and strategy - should New Zealand implement a national programme in environmental education, and if so, how? What educational purposes should be sought in the name of environmental education in New Zealand and what general principles should apply to their organisation within national curricula? Broad features of a strategy of implementation were sought, rather than the production of a curriculum or teaching package in the name of environmental education.

My general approach to the development of a research programme has been first to identify the major policy questions to do with the implementation of environmental education. Those questions are then examined individually by means of appropriate research studies. Finally, the answers are placed together on the table, so to speak, so that their policy implications, each in the context of the others, can be judged properly. Four key questions have been identified, each of which is introduced below. Four chapters follow, each of which examines one of the questions. Chapter six then explores the implications for national educational policy and strategy of the collective results of the studies.

The four questions that are taken up in this study are set out below. The justifications for the selection of these particular questions (as opposed to other questions that might be asked) are dealt with in full in the individual studies that follow. They are noted only briefly here. The questions are as follows.

QUESTION ONE: What exactly is environmental education?

This question exists at two levels. First, a number of factors have contributed to a process in which the central concept of environmental education became swamped by variants and camp-followers during the early phase of its evolution. Many practices are now conducted in the name of environmental education that have only tenuous connections to the 'real thing'. At the second level this question has to do with communicability. Once the variations and mutations are peeled away, the 'real thing' proves to be an educational concept that is too abstract (in the sense of being remote from the classroom). I will argue that there is a need to define, or better to explain, environmental education in terms that teachers can understand and, most importantly, can implement. In addressing both questions noted here to do with the nature of environmental education, there is a need to bring about a shift away from the philosophical and towards the practical.

QUESTION TWO: What are the implications for the implementation of environmental education of present understanding in the field of curriculum innovations?

Environmental education qualifies as a curriculum innovation. A considerable amount of research has been conducted into the fate of curriculum innovations. In particular, educational researchers have attempted to

identify factors that contribute either success or failure to attempts to change what teachers teach. Present understanding in the field of curriculum will emerge here as having significant implication for environmental education. Those implications do not yet appear to have made an impact upon what environmental educators try to do.

QUESTION THREE: What are the environmental issues and problems that should form the basis of a New Zealand programme in environmental education? Properly understood, environmental education is a problem solving strategy in which students learn about, and learn to solve real world problems facing their own society and the global society. Any national strategy for environmental education should be based upon what is here called a 'framework', by which I mean relevant national environmental perceptions and associated problems. In other words, if environmental education is about environmental problems, which environmental problems should New Zealand environmental education be concerned with? I will argue here that difficulties to do with the selection and justification of a national framework may have been underestimated in the development of other national responses. In fact, the deeper the question of the nature of environmental problems is pursued, the more fundamental become the implications.

QUESTION FOUR: What aspects of existing classroom practice contribute to the intentions of environmental education? A national strategy for the implementation of environmental education has the task of moving schools and teachers from where they are now to where the innovation requires them to be. Effective educational planning requires a good understanding of both the

starting point (i.e., existing practice) and the finishing point (goals of a national programme in environmental education). A strategy for implementation should acknowledge both the strengths and the weaknesses of existing practice.

Thus the study as a whole is multi-disciplinary and involves four research topics, in two categories. The first category involves two topics dealing with the philosophy and intentions of environmental education - what it is in general terms; and, what it becomes when adapted to New Zealand's social, resource and environmental circumstances. The second category involves two research topics involving issues to do with schools and schooling - what the general implications are from the field of curriculum innovation; and, the nature of existing practice in New Zealand schools in relation to environmental education. Two of the four topics, one from each category, are approached as literature reviews. These are, the nature of environmental education and the implementation of curriculum innovations. The remaining two topics, again one from each category, are developed as experimental studies. The development of a framework for a New Zealand environmental education strategy is approached by means of social survey of a group of expert environmental managers. Existing classroom practice is examined by means of an observational study of live teaching in a case study of New Zealand classrooms.

Two further points should be made about the studies that follow. The first is that, inevitably, there is no completely satisfactory order in which to present them. The studies tend to complement each other. Perspectives gained in studies presented in later chapters are sometimes important in shaping aspects of work presented

earlier, and vice versa. Thus there is some unavoidable referring back and forward. The two review studies, the nature of environmental education and the implementation of curriculum innovations, are placed first, in chapters two and three respectively. The two experimental studies then follow in chapters four and five. The second point is that none of the four topics is intended to be pursued to such depth that it stands as a doctorate level study in its own right. Each is required to have sufficient integrity to be philosophically or scientifically defensible in its own terms. Beyond that, the strength of this thesis should be sought in the breadth of relevant issues canvassed and in the union of perspectives gained from several disciplines.

Finally, it should be noted that there are 'worthy questions' to do with implementation of environmental education that have not been explored here. In particular, there are three : questions to do with sequence and structure in environmental education curricula; questions of teaching method, or pedagogy; and, evaluation methods (Tyler, 1949). These questions have been passed over because it is argued that the matters of educational policy and strategy being explored here are prior questions.

CHAPTER TWO

THE NATURE OF ENVIRONMENTAL EDUCATION

If we are to study an educational programme systematically and intelligently, we must first be sure as to the educational objectives aimed at.

Ralph Tyler, 1949

We must be clear about the end if we are to develop the means.

Lawrence Stenhouse, 1975

2.1 INTRODUCTION

Environmental education was founded on deceptively straightforward beliefs: human societies face problems in their relationship with the environment; those problems are significant and require solution; education can and should contribute to those solutions (Frankel, 1970). However straightforward, those beliefs have involved the supporters of environmental education in a 20 year search for solutions to a number of complex theoretical and practical issues. The nature of those issues and the extent to which they have been solved will be given emphasis in the review that follows.

The theoretical issues are primarily to do with the nature of the problems that give rise to the need for environmental education. The search has been for an

agreed 'framework' that properly represented all relevant environmental problems. Major changes have occurred in the framework during the evolution of environmental education. The practical issues are to do with the ways in which schools and teachers might put environmental education into practice. Considerable debate and confusion have surrounded this issue. Progress has been limited to defining broad approaches that environmental educators consider capable of being translated into educationally viable programmes. Such limited progress has been made with the translation of the philosophy of environmental education into recognisable, proven programmes, that in the opinion of some, it is an idea that has begun to die before being fully born:

[Environmental education] has not been able to be implemented in school curricula in its full meaning and indeed could be said to have been neutralised through incorporation into the existing hegemony of Australian education. (Greenall, 1981)

Despite the difficulty and the uncertainty surrounding environmental education it has always been a rallying point for people seeking a new kind of education, and even a new kind of society (Harman, 1970). Its diffusion and uptake have been rapid. During the first decade of its evolution, a popular quotation with which to begin a learned article on environmental education was that of Victor Hugo (see Appendix 2A):

There is no force greater than an idea whose time has come.

Environmental education experienced rapid and dedicated uptake of its complex and only partly worked out philosophy by people with a range of different educational and social goals. The result has been the spawning of numerous variations on the original theme. The result of that in turn has been that the question,

what is environmental education? has been a difficult one on which to obtain any degree of consensus. Not all of the variants, however, do equal justice to the intentions of environmental education.

2.2 THE EVOLUTION OF ENVIRONMENTAL EDUCATION

Because of the complexity and uncertainty that can be found within the boundaries of the discipline of environmental education, it is worthwhile following the evolution of the original concept. The development of environmental education has taken place in two stages. The first involved the original Western concept which began in America and diffused to other OECD countries. The second stage involved the United Nations organisations Unesco and UNEP. During this period the Western concept was substantially modified by the addition of perspectives from less developed countries.

2.21 ORIGINS

Environmental education is a product of the American education system. Both its environmental philosophy and its educational philosophy can be traced to movements within American education (Roth, 1978). Environmentally, its pedagogical parents appear to have been conservation education and outdoor education, both of which had their roots in the subject of nature study (Bailey, 1903). Educationally, environmental education owes much to the humanistic and experiential goals of John Dewey and the progressive education movement (Roth, 1978).

According to Charles Roth, conservation education and outdoor education both developed together in America during the 1950s and 1960s (Roth, 1978). The American conservation education movement originated largely as

public relations activities sponsored by governmental agencies with resource management responsibilities. Conservation education emphasised the dissemination of information. It involved the expenditure of a great deal of money on materials that were largely information and of little educational value (Brennan, 1969). Conservation education in New Zealand, which is funded by the Department of Lands and Survey, has recently been taken to task on identical grounds (Jowett, 1983). Outdoor education, on the other hand, emphasised process goals and outdoor experiences (Sharp, 1957). It is a characteristic of outdoor education that it has been slow to develop identifiable educational objectives beyond exposing children to the 'wonders of nature' (Mackay, 1981; Nichols, 1982).

The use of the term 'environmental education' began in the early 1960s to refer to an ecologically centred, problem oriented fusion of conservation education and outdoor education (Roth, 1978). Matthew Brennan is usually accorded the honour of having used the term for the first time (Brennan, 1964). The early development of the concept was fostered at a series of conferences held in the name of conservation education at the Pinchot Institute for Conservation studies of which Matt Brennan was the director (Brennan, 1969). These conferences began a search for an environmentally adequate and educationally feasible formulation of environmental education. As the environmental educators continued the development process, Western culture became increasingly receptive to their emerging philosophy.

The decade between the early 1960s and early 1970s provided an ideal climate for the spread of environmental

education. A series of events placed before the conscience of Western culture issues to do with global population, resource depletion and environmental quality. The decade began with the publication of Rachel Carson's Silent spring (Carson, 1962). Mid-decade, Adlai Stevenson coined the metaphor 'spaceship earth' in a speech before the United Nations. The year 1969 saw the publication of the first photographs of earth from space, which gave dramatic substance to Stevenson's vision. In 1972 the first report to the Club of Rome, based on the first computerised simulation of the human system, predicted rapid depletion of available resources, exponentially growing pollution and widespread starvation leading to a population crash (Meadows, 1972). One year later the formation of OPEC cartel brought home to the citizens of Western nations the vulnerability of their human ecology to resource constraints. Environmental education, as a philosophy devoted to solving the human/resource/environment crisis, was clearly "an idea whose time had come".

2.22 EARLY FORMULATIONS

The new synthesis of outdoor education and conservation education became a rallying point for environmentally-conscious educators. Specialists in conservation education, population education, human ecology, resource management, science education and social science education saw their own field as being part of the emerging concept of environmental education (Schoenfeld and Dissinger, 1977). However, despite its many connections to existing curricula, environmental education was clearly intended to be more than a re-

assembling of old pedagogies. Its supporters' ambitions went beyond a judicious mix of existing curricula and educational intentions. According to Brennan (1969):

..past and present activities [in education about the environment] have been suspect in their effectiveness and efficiency.. the need for a.. [new] study has an essential urgency as prescribed by the seemingly inefficient environmental education of the present..

Environmental education was to be a new, improved product.

As a new educational idea environmental education presented its supporters with the task of defining an environmental philosophy and establishing a pedagogy for its transmission. There were two crucial questions: What is environmental education; and, how do you teach it? Recorded below are five influential early answers to these questions.

In 1968, Professor William Stapp and a group of graduate students in the Department of Resource Planning and Conservation at the University of Michigan, developed the following definition of environmental education. It was later published in the first edition of the Journal of Environmental Education (Stapp, 1969).

Environmental education is aimed at producing a citizenry that is knowledgeable concerning the biophysical environment and its associated problems, aware of how to help solve those problems, and motivated to work towards their solution.

The major objectives of environmental education are to help individuals acquire:

1. A clear understanding that man is an inseparable part of a system, consisting of man, culture, and the biophysical environment, and that man has the ability to alter the interrelationships

of this system.

2. A broad understanding of the biophysical environment, both natural and man-made, and its role in contemporary society.

3. A fundamental understanding of the biophysical environmental problems confronting man, how these problems can be solved, and the responsibility of citizens and government to work towards their solution.

4. Attitudes of concern for the quality of the biophysical environment that will motivate citizens to participate in biophysical environmental problem-solving.

Robert Roth (1969) developed 157 principles and concepts for environmental management education from an analysis of existing school textbooks. He then invited a large panel of environmental management educators and practitioners to rank the concepts as examples of "what students should know about environmental management education". Roth's top twelve concepts are included here, along with his original classification of each concept (Table 2.1).

An early formulation that appears to have been influential in Western Europe was that of the International Union for the Conservation of Nature and Natural Resources (IUCN) (Bjorndal and Leiberg, 1971; Forselius, 1971). The IUCN definition was given prominence in Europe and has become the definition upon which many European, and particularly Scandinavian, environmental education programmes are based. In 1970 the IUCN Commission on Education published the following definition:

Environmental education is the process of recognising values and clarifying concepts in order to develop skills and attitudes necessary to understand and appreciate the inter-relatedness among Man, his culture and his biophysical surroundings. Environmental education also entails practice in decision-making and self-formulation of

RANK	CONCEPT	CLASSIFICATION
1	Living things are interdependent with one another and their environment.	(universal)
2	Safe waste disposal... is important if the well-being of man and the environment is to be preserved.	environmental problems
3	Man has been a factor affecting plant and animal succession and environmental processes.	environmental management
4	The management of natural resources to meet the needs of successive generations demands long-range planning.	environmental management
5	Water supplies, both in quantity and quality are important to all levels of living.	natural resources
6	Man has the responsibility to develop an appreciation and respect for the rights of others.	socio-cultural environment
7	Natural resources are interdependent and the use or misuse of one will affect others.	ecology
8	Individual citizens should be stimulated to become well informed about resource issues, problems, management procedures and ecological principles.	socio-cultural environment
9	Environmental management involves the application of knowledge from many different disciplines.	environmental management
10	Maintaining, improving and in some cases restoring soil productivity is important to the welfare of people.	natural resources
11	In any environment, one component like: space, water, air, or food may become a limiting factor.	ecology
12	Most resources are vulnerable to depletion in quantity, quality or both.	natural resources

TABLE 2.1: Robert Roth's top twelve principles.

a code of behaviour about issues concerning environmental management.

In America pressure for action on environmental education resulted in congressional hearings for an Environmental Education Act (Morrissett and Wiley, 1971; Linke, 1974). The initial draft of the Act (quoted in Linke, 1974) defined environmental education as:

..an integrated process which deals with man's interrelationship with his natural and man-made surroundings, including the relation of population growth, pollution, resource allocation and depletion, conservation, technology and urban and rural planning to the total human environment. Environmental education is a study of the factors influencing ecosystems, mental and physical health, living and working conditions, decaying cities, and population pressures. Environmental education is intended to promote among citizens the awareness and understanding of the environment, our relationship to it, and the concern and responsible action necessary to assure our survival and to improve the quality of life.

Morrisset and Wiley (1971) distilled from the evidence of those who presented submissions at the Congressional hearings for the Environmental Education Act, the following set of educational objectives:

- 1) environmental education should be designed to increase the level of knowledge of the general citizenry about natural and social systems and the interfaces between them...
- 2) it should promote a holistic rather than specialised approach to learning and problem-solving...
- 3) it should increase our inclination and ability to predict consequences and make sound choices among alternative courses of action before taking them...
- 4) it should encourage development of the 'real world' coping skills necessary to bring about changes in society and technology...
- 5) it should promote examination and re-orientation of individual and collective values which contribute to dysfunctional man/environment relationships...

6) to be effective, not only should it be about the environment both social and natural - but also should take place in the environment being studied.

Several differences should be noted between these early formulations of the nature of environmental education. Robert Roth defined environmental education in purely cognitive terms. More widespread knowledge of facts and principles to do with human ecology was all that was required to solve the environmental crisis. Bill Stapp and his students saw environmental education as being primarily about environmental problems and problem solving. Their definition emphasised cognitive understanding of human ecology and its associated problems. They also sought the development of personal beliefs that would lead to 'problem solving' (which here means action). The IUCN definition placed emphasis on changing values and lifestyles as an approach to solving environmental problems. Finally, Morrissett and Wiley's analysis of congressional evidence added a further element - "...real world coping skills necessary to bring about change..". Their definition suggested that they had in mind an environmental form of civics education.

The early statements quoted above set down between them the six major elements of environmental education. These elements are set out below and defined with the terms that I will use for each in the remainder of this text. There is an element of confusion in the literature about the labels. For example, 'problem solving' sometimes refers to 'seeking solutions to problems', sometimes to what is here called 'decision making', sometimes to remedial action and sometimes to all of these. Consistent use of terms is necessary. The six recognisable elements of environmental education are as

follows. Environmental education involves:

- COGNITIVE LEARNING. The learning of facts and principles to do with human ecology (i.e., the interrelationship between human-kind and nature). The learning of facts and principles to do with environmental problems;
- VALUES CLARIFICATION. The examination of individual and social beliefs that underlie and give rise to environmental problems;
- VALUES CHANGE. The formulation by students of beliefs about people and the environment that will both support remedial action on existing problems, and prevent the arising of new ones;
- PROBLEM SOLVING. The defining of workable solutions to environmental problems;
- DECISION MAKING. Learning about existing social institutions with environmental management responsibilities. Learning to participate in the social decision making process; and,
- ACTION. Implementing solutions to environmental problems through individual action, community action or the making of lifestyle choices.

2.23 DIFFUSION AND CONFUSION

As 'an idea whose time had come', environmental education experienced rapid diffusion both within America and abroad. American programmes are reviewed by Dissinger and Lee (1973) and Childress and Wishart (1976). By the mid 1970s environmental education had already influenced curriculum development around the world: in England (Carson, 1972; NAEF, 1975); Norway (Bjorndal and Leiberg, 1971); Sweden (Forselius, 1971); Israel (Blum, 1974);

India (Galushin and Doraiswami, 1972); Canada (Public Advisory Committee, 1974); Japan (Nokayama, 1975); Federal Republic of Germany (Blackbourn, 1972); Australia (Linke, 1974); Egypt (ALESCO, 1974); and other countries that have either not documented their experiences or done so in languages other than English. More detailed studies of national environmental education programmes are given in Saveland (1976), UNESCO (1977), Bakshi and Naveh (1978), Shaffer (1978) and Scott (1980). It is not necessary to review individual national programmes here. Instead the phenomena reported as being common to many of them will be identified.

By the mid 1970s environmental education both in America and elsewhere had developed to the point at which two fundamental questions were becoming increasingly clear - what exactly is it and, how do you teach it? Both issues were articulated in 1974 in a perceptive paper by Thomas Tanner, entitled Conceptual and instructional issues in environmental education today.

Conceptually, the problem was one of excessive breadth. It had become difficult to nominate any aspect of the human and natural worlds that was not within the ambit of some formulation of environmental education. The original idea of learning more about problems in human ecology had been swamped by the conceptual baggage of so many well-intentioned recruits all arriving under the banner of multidisciplinary. Such broad formulations faced the real danger of attempting so much that nothing would be achieved (Dissinger, 1972; Tanner, 1974; Linke, 1977).

The instructional issues paralleled the conceptual problem. In addition to the great breadth of topic there

was no agreement about the kinds of instruction implied by the objectives of environmental education (Tanner, 1974). Three broad variants had emerged, each with its attendant instructional implications: cognitive learning; values education; and, community action. Robert Roth (1969; 1979) and others (Southern, 1969; Ramsey, 1977) established a strong claim for cognitive learning as the core of environmental education:

There is little doubt that the development, continuance and strengthening of environmental education programs depends to a great extent on the development of a sound conceptual core. (Roth, 1979).

Others, proceeding from the IUCN statement quoted previously, saw environmental education principally as values education (Lamb, 1975; Miles, 1977). Often, values change was proposed, disguised somewhat, as 'developing positive attitudes towards..' (Tanner, 1974). Still others proposed programmes that centred around student-led action programmes directed towards the resolution of local environmental problems (Stapp, 1971; Linke, 1974; Hall, 1977). Abraham Blum (1980) emphasised the importance of problem solving and action (which he calls 'decision-making'):

Environmental educators... have stressed, again and again, the importance of decision-making as a topic in environmental education.

Still others saw environmental education as a combination of several elements. Mayfield (1977) suggested:

Environmental education remains untaught in every sense, unless at least three things are achieved beyond doubt. These are:

- attitudes;
- genuine personal action;
- the transfer of knowledge and skills to new situations.

Throughout this diversity of topic, objective and instructional method, the original pedagogies of outdoor education (Colpitts, 1979) and conservation education (Asch and Shore, 1975) continued to develop, often proceeding under the new name of environmental education. The surge of interest in the environment and in teaching to do with the environment, was a pasture in which many came to graze their cattle.

The broadening of environmental education in both its conceptual and instructional dimensions resulted in extraordinary diversity among programmes. One result of this diversity was widespread confusion about its nature and intentions. In their introduction to a review of environmental education in America, Schoenfeld and Dissinger (1977) wrote:

Barring reading, writing, and arithmetic, few subjects are being taught today in so many diverse ways and places, by such a mixture of agencies, groups, institutions, and people, as that complex of cognitive content and affective process known, precisely or not, as environmental education. To paraphrase, Aldo Leopold (1938), it is, by common consent, a good thing to engage in environmental education. But wherein lies the goodness, and what can be done to encourage its pursuit? On these questions there is confusion of counsel, and only the most uncritical minds are free from doubt.

It was only the initiation of the United Nations programme in environmental education that re-emphasised the essential nature of environmental education.

2.24 THE Unesco/UNEP PROGRAMME

With such widespread international interest in environmental education it was not surprising that the matter was raised at the United Nations sponsored Stockholm Conference on the Human Environment in 1972. The Stockholm Conference capped a decade of increasing international concern about the deteriorating human

environment. Delegates at Stockholm recognised the contribution that environmental education was capable of making towards greater environmental understanding and called for all educational systems to focus their resources on the problem. Professor William Stapp was recruited from America to head a new Unesco/UNEP programme - international environmental education. The international programme included a workshop at Belgrade in 1975 to develop a framework for the international programme; a series of Unesco regional meetings during 1976 to consider national responses to Belgrade documents; and a ministerial level Unesco conference at Tbilisi in 1977 to involve governmental representatives in the implementation of environmental education. The international programme from Stockholm to Tbilisi is reviewed by Fensham (1978); Berry (1978); and, Stapp (1979).

It was at Belgrade, in October 1975, that environmental education became a global strategy. Experts representing functional educational programmes from many countries were confronted with the diversity of their programmes and methods, and an equal diversity of their underlying environmental concerns (Fensham, 1978). In particular there was a difference between the frameworks of the developed and less developed worlds. (I continue to use the term 'framework' here to mean an underlying environmental perception and its associated agenda of environmental concerns). Until Belgrade, Western environmental education was framed by Western environmental concerns. These included intranational problems of developed countries, like pollution and species protection; and to a lesser degree with international problems of the global system, such as population growth and depletion of energy supplies.

Delegates from less developed countries were concerned about infant death rates, literacy, basic services like water and hygiene. At an international level they were concerned about domination of the world system by the monetary system of the West (Fensham, 1978; Chiappo, 1978).

Leopoldo Chiappo presented the case for the third world as follows:

So the main questions that we have to ask are the following: can we Latin Americans, Africans and Asians, inhabitants of the needy south, accept as valid the way of seeing and interpreting ecological facts adopted by the countries of the super-industrialised, wealthy north? Is it not necessary to reveal the ideology that underlies the attitude of dominance?...

(This creates)..the need for a fresh angle on the fundamental issues of environmental education. In our view, these are two: the awakening of a critical awareness and the development of a new ethic of liberation. Concerning them we can make the following two summary statements: first, environmental education must pay critical attention to the economic, technological, socio-political and ethical factors that are the root of ecological problems and their solution. Second, the new ethic of liberated man should revise the terms of relation between man and nature that has evolved in the course of the history of industrialised man in the western hemisphere...

Failure to tackle these two issues may reduce environmental education to a purely pedagogical and informative exercise, aimed at training children not to ill-treat plants, adults in the community not to dump rubbish and industrialists to clean up their technology by making appropriate investments. (Chiappo, 1978).

Peter Fensham has reported that Belgrade functioned well as a workshop. Delegates gave serious consideration to all viewpoints and many previously dominant positions were revised or replaced, both with respect to the framework for environmental education and its associated pedagogy (Fensham, 1978).

The outcomes of the Belgrade Workshop are presented in the Belgrade Charter (Appendix 2A; Unesco/UNEP, 1976). The Charter is an heroic document. Revolutionary in its tone, it calls upon the world's educators to join the movement for the salvation of the world:

The reform of educational processes and systems is central to the building of [the] new development ethic and world economic order. Governments and policy-makers can order changes, and new development approaches can begin to improve the world's conditions - but all of these are no more than short-term solutions, unless the youth of the world receives a new kind of education.

The Belgrade Charter also offered several developments which further broadened the concept of environmental education. In particular, the framework was broadened by the addition of perceptions of 'the problem to be solved' stemming from less developed countries. Both the objectives of environmental education and its intended audience were also re-defined in a broadening way.

The framework for international environmental education set out in the Belgrade Charter is considerably broader than the ideas underlying western programmes. To the ecological problems of environmental deterioration and resource depletion that formed the central concerns of western environmental education, Belgrade added, even superimposed, economic and political questions to do with the distribution of the world's available resources. Equitable distribution of resources, and the provision of resources for the development of underdeveloped societies were more important issues than resource conservation. Inequalities arising from the current international economic system were more significant than global population growth:

The recent United Nations Declaration for a New International Economic Order calls for a new

concept of development - one which takes into account the satisfaction of the needs and wants of every citizen of the earth, of the pluralism of societies and of the balance and harmony between humanity and the environment. What is being called for is the eradication of the basic causes of poverty, hunger, illiteracy, pollution, exploitation and domination. The previous pattern of dealing with these crucial problems on a fragmentary basis is no longer workable.

It is absolutely vital that the world's citizens insist upon measures that will support the kind of economic growth which will not have harmful repercussions on people; that will not in any way diminish their environment and their living conditions. It is necessary to find ways to ensure that no nation should grow or develop at the expense of another nation and that the consumption of no individual should be increased at the expense of other individuals. (Unesco/UNEP, 1976).

The Belgrade Workshop also broadened both the objectives and the audience for environmental education. Western programmes had tended to develop environmental education either on the basis of content or process objectives - either as a body of facts and principles to be taught or as a way of teaching. Belgrade combined both of these approaches (see Appendix 2A). In particular, new emphasis was placed upon action. Environmental education should, "help individuals and social groups develop a sense of responsibility and urgency regarding environmental problems to ensure appropriate action to solve those problems". Whereas Western programmes were largely school based, the charter proposed that, "the principal audience of environmental education is the general public". Within 'the general public', the Charter recognised three principal groups. These were, the formal education sector, environmental professionals and the adult public.

Following the Belgrade Workshop, the international programme continued during 1976 and 1977 with meetings in

each of Unesco's five regions (Stapp, 1979). The regional workshops provided individual countries with an opportunity to respond to and refine the philosophy set down at Belgrade. Finally, the Unesco/UNEP programme culminated in a ministerial level intergovernmental conference at Tbilisi, in Georgia, USSR. The Tbilisi conference was intended to reconsider the outcomes from Belgrade in the light of the regional meetings and to formulate governmental policies for implementation. Many recommendations were passed (Unesco, 1978). However, the concept of international environmental education developed at Belgrade was changed little.

The Belgrade and Tbilisi meetings came to almost the same conclusions regarding the nature of environmental education (see Recommendation No.2, Unesco, 1978). The list of objectives for environmental education developed at Belgrade is set out below. Following Annette Greenall (1980), additions made at Tbilisi are underlined and deletions are placed in brackets:

AWARENESS: to help social groups and individuals acquire an awareness of and sensitivity to the total environment and its allied problems.

KNOWLEDGE: to help social groups and individuals gain a variety of experience in, and acquire a basic understanding of, the environment and its associated problems [and humanity's critically responsible presence and role in it].

ATTITUDES: to help social groups and individuals acquire [social] a set of values and [strong] feelings of concern for the environment, and the motivation for actively participating in environmental improvement and protection.

SKILLS: to help social groups and individuals acquire the skills for identifying and solving environmental problems.

[EVALUATION ABILITY: to help individuals and social groups evaluate environmental measures and education programmes in terms of ecological, political, economic, social, aesthetic and educational factors].

[PARTICIPATION: to help individuals and social groups develop a sense of responsibility and urgency regarding environmental problems to ensure appropriate action to solve those problems].

PARTICIPATION: to provide social groups and individuals with an opportunity to be actively involved at all levels in working toward resolution of environmental problems.

The most significant change made at Tbilisi to the list of objectives for international environmental education was the complete deletion of the objective to do with 'evaluation' (which has a broadly similar meaning to what I am calling decision-making). The Belgrade Charter had proposed that environmental education should develop in society the capacity to "evaluate environmental measures and educational programmes" in terms of their acceptability from several standpoints, including the political. This objective implied that schools should devote themselves to the criticism of governmental programmes. Peter Fensham suggests that the conference, composed of governmental representatives, dropped it for this reason (Fensham pers. comm. cited in Greenall, 1980). Less significant is the change to more positive wording in the participation objective. Participation in the resolution of environmental problems is stressed. It is also suggested that authorities have an obligation to provide opportunities for participation by citizens. The amended list of objectives is known as the Tbilisi checklist.

The Unesco/UNEP programme succeeded in creating and promoting an agreed international concept of environmental education. The Belgrade Charter presented a perfectly comprehensive statement of the rationale and 'guiding principles' for international environmental education. The Charter and the Tbilisi checklist

together formed the clearest theoretical statement of the nature of environmental education yet developed. Confusion over the intention and the broadest features of the methods was dispelled. At Tbilisi that formulation was presented to and endorsed by governmental representatives from 70 countries (Stapp, 1979). These were substantial achievements.

What Belgrade did not do, however, was to make environmental education any more teachable. Before Belgrade, Western programmes faced two significant problems -- the central concept of environmental education had been lost among the variants; and, the objectives had become so broad that it was difficult to envisage the total concept ever being taught successfully (Tanner, 1974). Belgrade contributed to a resolution of the first of these problems. It made the second considerably worse (Grenall, 1980) by combining the process elements from most formulations of environmental education into a single package. It also broadened the range of environmental issues to be addressed.

2.25 SUMMARY

When the Unesco/UNEP formulations are compared with early American statements of the nature of environmental education, both similarities and differences can be seen. The greatest similarity lies in the nature of environmental education itself. The educational philosophy embodied in the Tbilisi checklist is not significantly different from the list of elements noted above as being contained in the total set of early American formulations. The greatest difference lies in the radical revision of the framework for environmental education, in the kinds of environmental problems that were to be addressed in the name of environmental

education. Environmental education began as a solution to problems perceived by American conservation educators. After Tbilisi, its framework emphasised equitable sharing of global resources over resource conservation and an end to economic exploitation over global population growth. The change in the framework was so fundamental that Matthew Brennan, who was there at the birth (Brennan, 1964, 1969) has concluded, post-Tbilisi, that environmental education has failed (Brennan, 1979).

The greatest remaining problem is that of teachability. As environmental education is now formulated, it presents Western schools (in particular) with two difficulties. The first is methods related and the second has to do with the purposes of schooling. In terms of implications for instructional methods, the objectives of international environmental education go well beyond the known capacity of conventional schooling. Saving the world is a demanding assignment for institutions that continue to have difficulty teaching students to read. There is a complex of unresolved problems to do with the invention, proving and introduction of appropriate forms of curriculum and instructional method. The problem of teachability is compounded by a lack of any significant evaluation establishing the achievement of objectives set down at Tbilisi. In 1976 Ronald Childress reported that:

The paucity of meaningful evaluation is a growing concern among curriculum planners working within the field.

I know of no significant studies published since that time capable of resolving this concern.

Assessments of current Western programmes.

While there does not appear to have been any evaluation studies that prove or disprove the viability of the

Unesco/UNEP model, several studies have assessed the nature of courses currently being offered in the name of environmental education (Smyth, 1977; Lucas, 1979, 1980; Greenall, 1980, 1981). These studies report a common view that environmental education is not yet able to be disseminated to teachers and implemented in its intended form. They identify two continuing difficulties. First, the problem of effective communication, of getting through to educators the correct message concerning the nature of environmental education. Second, the problem of incorrect responses, even where educators are fully acquainted with the Unesco/UNEP model. With respect to the first of these problems, Lucas (1980) suggests that:

Unless there is a clear change of perception, a developing consensus, a sense of unity and purpose, then environmental education will continue under a cloud of confusion.

The second problem has to do with deficiencies in the courses and instructional materials that result even when the true nature of environmental education is understood. Both Lucas (1980) and Greenall (1980, 1981) report a limited number of 'correct' programmes and many 'incorrect' ones. Both identify the same phenomenon. It involves the translation of 'true' environmental education back into instructional strategies characteristic of conventional teaching about the environment. Annette Greenall based her findings on responses to environmental education in Australia. Arthur Lucas has considered environmental education in Science, internationally.

Lucas has examined the characteristics of environmental education as it occurred in a selection of science courses throughout the english-speaking world (Lucas, 1980). In a paper entitled, Science and environmental education: Pious hopes, self praise and disciplinary

chauvinism, Lucas reports that most environmental education programmes were either developed by modification of existing science courses, or were new courses that chose science education as the principal disciplinary vehicle. Science education therefore had a significant role in environmental education, internationally. However, Lucas also found that the established science education base had usually absorbed the environmental education flavouring with only limited change to the essential nature of what was normally taught. Most courses were constructed around the belief that the objectives of environmental education required a solid grounding in scientific understanding about the environment. The 'solid grounding in science' took over.

Annette Greenall has recorded the history of environmental education as a curriculum for Australian schools. Considerable effort has been devoted to the development and implementation of environmental education in Australia. Those efforts have included a conference sponsored by the Australian Academy of Science in 1970 (Evans and Boyden, 1970); the incorporation of a pro-environmental education plank in the political platform of the (later victorious) Australian Labour Party in 1972 (Greenall, 1981) and a five day Unesco seminar in 1975. The published record of the Unesco seminar makes it clear that the Australian environmental education establishment was at that time in a position of international leadership (see Linke, 1977). Educators and curriculum developers were dealing with the 'real' concept of environmental education and grappling with fundamental issues to do with its implementation.

As the head of Australia's environmental education

curriculum development and dissemination project (Greenall, 1980) Annette Greenall has concluded that schools have been little changed by 10 years of effort. An ambitious 'Action Plan', which put "forward a new model of curriculum development in an attempt to meet the needs and characteristics of environmental education", (Greenall, 1981) was largely forestalled by political forces within the educational establishment. A later project commissioned the development of a range of classroom materials from teachers with established programmes in environmental education of any kind. The resulting materials:

Met neither the expectations nor priorities of the Project. They revealed that much that was believed to be environmental education or was put forward as such, was mainly nature study and field studies.. Very few of the submissions had either action or overt 'for the environment' (affective) components (Greenall, 1981).

The reports of Lucas (1980) and Greenall (1980, 1981) provide a limited basis on which to make generalisations about the state of post-Tbilisi environmental education. Nevertheless, the two studies both complement and support each other. They are complementary in that while Lucas reported on the environmental education components of one subject in several countries, Greenall considered teachers' responses to environmental education in many subjects and levels within a single country. The two studies are supportive in that they tend to report the same phenomenon: Environmental education usually has been translated back into a kind of instruction not too different from what was done before. Greenall (1981) suggests that environmental education:

..has been subjected to incorporation within the existing hegemony in a neutralised form - the radical 'action' components having been deleted and the less controversial cognitive and skill ones retained, together with the name 'environmental

education'. It is then claimed that the programme is environmental education.

Annette Greenall's explanation for the apparent castration of Australian environmental education is to cite Musgrave (1979):

Those in power do not wish the present distribution of knowledge to be changed or even challenged.. Radical changes in the distribution of knowledge rarely go unchallenged.

The argument developed in the next chapter of this study is that less hegemonic, more routine matters are involved which have to do with the implementation of curriculum innovations. The fate of the innovation 'environmental education' (as described by Greenall and Lucas) is in no major way different from any other externally planned change to the culture of the school. It could, in fact, be predicted from present understanding of both the nature of environmental education and the documented history of attempts at curriculum innovation or even social change in general.

The second difficulty to do with the teachability of environmental education has to do with the implications of established relationships between the Western school and its society (Mayfield, 1977; Stenhouse, 1977). In international environmental education, the school becomes a focus for community action and an agent for social change (Greenall, 1980). In societies of our type, the accepted role of the school includes neither of those roles. In particular, the change agenda entrusted to the school by the Unesco/UNEP programme is not one that all members of Western societies would accept. This argument is developed further in chapter four.

2.3 KEY ELEMENTS OF A NATIONAL ENVIRONMENTAL EDUCATION STRATEGY

The review to this point suggests that the difficulties presented by the philosophy of environmental education are not yet fully resolved. At a national level the curriculum designer and teacher still face two key questions - what is environmental education for us, here; and, how can it be taught successfully by our teachers in our schools? Elements of the answers to these questions are developed progressively through the remainder of this text. At this point I wish to develop those aspects that arise directly from the review material introduced above.

It is my argument here that a national strategy for environmental education requires three component parts: a national framework, a process definition and a content definition. Each of these parts should be formulated in such a way that environmental education is more of a practical strategy and less of a theoretical concept. Schools deal in simple ideas. The simplicity of environmental education is yet to be revealed.

A national framework is required on two grounds. First, because each society must "clarify for itself", in the words of the Belgrade Charter, the environmental perceptions and priorities that should stand behind its national programme. Questions of relevance are involved.

The second requirement for a national framework stems from the need that I see to begin constructing environmental education programmes in a new way. I have taken to heart Jerome Brunner's view that a school curriculum in any subject should be "representative of the fundamental nature of the discipline from which it is

drawn" (Brunner, 1960). The fundamental nature of the discipline environmental education involves the encountering of socially-relevant environmental problems and approaching them in a problem-solving way. An environmental education programme, therefore, ought to be constructed from environmental problems and problem solving strategies. It is at least possible that one of the reasons why environmental education continues to be interpreted in conventional cognitive terms is because programmes continue to be defined in a manner that invites, even demands, cognitive treatment. Questions to do with environmental problems and their implications for what is taught in the name of environmental education are further developed in chapter four.

Clear statements are also required of the nature of environmental education in both content and process terms. Educational process has to do with what teachers do by way of instruction. Educational content involves what students are given to learn (Ramsay, 1977). Clarity is required because of the need for better communication with teachers. Problems resulting from uncertain communications have already been noted (Lucas, 1980). Further emphasis will fall upon the need for most precise communication of curriculum innovations in the review presented in chapter three.

The national framework for environmental education and its associated content definition will be developed in chapter four. The process definition is presented below.

2.31 A PROCESS MODEL

Material introduced in the following chapter will suggest that the successful introduction of a new educational idea requires effective communication with teachers.

This is particularly the case where changes in classroom process are involved. Where this is the case, the need for effective communication may extend to a need for teachers to be re-trained. A national strategy for environmental education, therefore, should involve a process definition designed explicitly for communication with teachers. The process model outlined below and shown in Figure 2.1 (Scott, 1984) has been used for this purpose at a number of environmental education courses for teachers with good results. It is a development of the Tbilisi checklist introduced earlier.

The model suggests that environmental education begins with the discovery of an environmental problem and ends with some form of positive action which contributes towards resolving the problem. Between the problem and the action there are five possible classes of teaching process, the relevance of each depending upon the circumstances. The five classes of teaching process are: environmental sensitivity development; values clarification; cognitive learning to do with environmental facts and principles; decision making, which here means learning based around the functions of existing social institutions for environmental management; and problem solving. Each of these process classes is further outlined below.

The first and most fundamental of the classes of teaching process is the development of attitudes of concern towards the problem-subject, which is here called 'environmental sensitivity development'. If students are indifferent to the problem further progress can only be made by means of a forced march. An approach of this kind is contrary to the philosophy of environmental education. Sensitivity development is therefore the

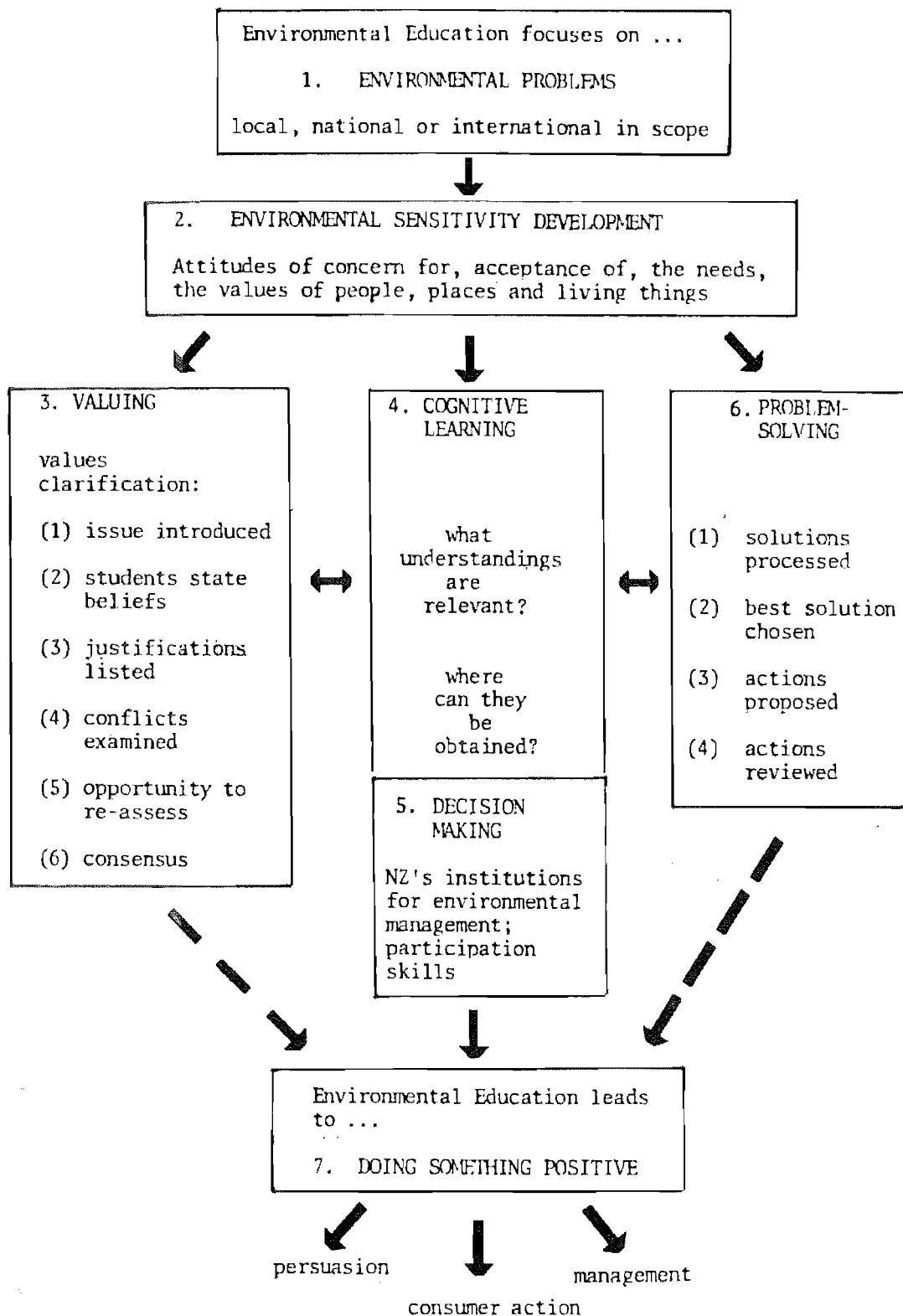


FIGURE 2.1: A process model for environmental education (Scott, 1984).

process of developing in students certain beliefs about an aspect of the environment. It is explicitly values directing.

Personal beliefs can also be involved in the process of environmental education in another way. Environmental problems may be social issues, in the sense that the problem is that different groups in society hold opposing views. Instruction may involve the exploration of different value positions, or the seeking of a consensus on what should be done.

Environmental education may involve cognitive teaching in two connections. In the first, teaching may have the intention of imparting facts and principles to do with the environmental problem. The model presented here suggests that cognitive material in environmental education should face a test of relevance before its introduction. If it is not useable for the purpose at hand (which is problem solving) then it has no value. The second connection in which environmental education may involve the process of cognitive teaching is to do with existing social institutions for environmental management. Teaching may be directed towards informing students about these institutions, their roles and their responsibilities. Participation skills may be developed.

Finally, environmental education may involve students in activities to do with problem solving. Alternative solutions may be defined and their implications explored. A 'best solution' may be chosen as a basis for individual, class or institutional action.

CHAPTER THREE

THE IMPLEMENTATION OF CURRICULUM INNOVATIONS

The enduring problem that has plagued the sponsors and planners of curriculum innovation is not the problem of creation, but the problem of impact, the failure to achieve anything like the mass conversion to new aims, new content and new approaches that they aspire to. The schools have not, it seems, been transformed by all the organised, systematised, specialised efforts of the professional innovators.

MacDonald and Walker, 1976

3.1 INTRODUCTION

Environmental education emerges from the previous chapter as an innovative educational philosophy that will require for its implementation significant changes in both the content and method of education. Potentially, it may influence teaching across the entire age range, from playcentre to university. It may even require changes in the beliefs society holds about the purposes of schooling.

However, the assumption appears to have been made by environmental educators that the move from international conference to classroom would be without significant problems; that a curriculum innovation such as environmental education is capable of being implemented more or less as planned; and that the actual outcomes would correspond to those intended by international level or national level curriculum designers. As the quotation above suggests, the experience of those whose field is

curriculum research indicates that assumptions of this kind are not warranted. Consequently, this chapter takes up for more detailed examination the implications for the implementation of environmental education of the educational field of curriculum.

The essence of the difficulty that will emerge here is this: on the basis of the documented outcomes of past attempts to bring about change in classroom teaching, externally planned curriculum change should be regarded as haphazard and fraught with difficulty. Even relatively limited changes in the curriculum that are proposed from sources outside the school, typically are either ignored by teachers or are transformed during implementation to something that bears little resemblance to the innovation as originally proposed. As William Reid (1975) suggests, schools put on, "...a masterly show of innovation without change". This resistance to the classroom use of planned curriculum change will be called, 'the curriculum problem'. The territory of the curriculum problem is the gap between the intention of the curriculum designer and the reality of the resulting classroom experience.

From the point of view of environmental education, the curriculum problem has a number of significant implications. Based on the general experience of curriculum developers to date, environmental education requires from schools and from teachers responses that appear unlikely to be forthcoming. The trappings may appear in the classroom but the substance will be left outside the door. In addition to the avoidance and mutation that are the fate of more ordinary curriculum innovation, the Unesco/UNEP concept of environmental education involves a number of features that make it more

than usually likely to face problems during implementation. More will be made of these problematic features later in this chapter. It follows from this discussion that the concept of environmental education should be interpreted in the full light of the curriculum problem. A curriculum in environmental education should be developed on the basis of the best possible understanding of the causes and cures of the curriculum problem.

Consequently, this chapter is devoted to an in-depth examination of the curriculum problem as it relates to environmental education. In reviewing the literature that has contributed to the current thinking of curriculum researchers, I have cast a wide net. There is a need to begin by carrying across into the arena of environmental education the set of concepts and experiences that have shaped the thinking of those in the field of curriculum. However, emphasis has been given to issues that focus on curriculum implementation, rather than on curriculum construction. Implementation is a prior question. Until you know how to get a curriculum into the classroom in working order, you ought not to begin building curricula.

The review leads to the question of a general method for maximising the success of a curriculum innovation. Curriculum researchers have long sought their pedagogical 'el dorado' - an infallible approach to curriculum by means of which an innovative educational idea could become a demonstraable set of learning outcomes. By general agreement (Hirst, 1975) no such approach exists. I will therefore propose something I will call an 'implementation checklist'. The implementation checklist is a list of factors that have been found in case studies

to affect adversely the uptake of innovations, unless appropriate attention is given to them. This is equivalent to the assumption that successful implementation of an externally planned curriculum innovation can be achieved through the avoidance of sources of failure. In other words, it is assumed that schools and teachers can accept change. One must simply find the right way of going about things.

The remainder of this chapter is organised as follows: I have begun by clarifying further both the emergence of the curriculum problem and some of the responses that have been made to it, by way of a discussion of the work of the British Schools Council. I conclude that no curriculum project yet developed appears to have completely escaped the curriculum problem. Explanations for the failure of externally-directed innovations are then examined. In general, these break down into two broad categories - those in which educational change is seen as a sub-category of social change in general, and those that identify a set of barriers to change that are held to be more or less unique to education. Closer examination suggests that the second not at all unique to education, but the division into general explanations and educational explanations provides a natural structure for what follows. On the basis of the total set of explanations the checklist model is proposed. The implications of the model for environmental education are taken up in chapter six.

3.2 THE CURRICULUM PROBLEM

According to Lawrence Stenhouse (1975), the field of curriculum study is concerned with two views of curriculum - as intention and as reality. The study of the curriculum as a statement of intentions for education is called 'curriculum development'. Stenhouse describes curriculum development as follows:

Its object is the betterment of schools through the improvement of teaching and learning. Its characteristic insistence is that ideas should encounter the discipline of practice and that practice should be principled by ideas. The curriculum development movement is an attack on the separation of theory and practice.

Stenhouse gives to curriculum as intention something of an heroic quality.

Curriculum as reality is a rather different matter. When the content of a new curriculum and the learning activities by which it is transmitted are examined at classroom level there is less heroism to be found. Instead, it is normal to find that there is a substantial gap between the curriculum as it was written by the designer and the curriculum as it is presented to the learner. I am calling this gap between the curriculum as intended by the developer and the curriculum as introduced by the teacher, 'the curriculum problem'. Like the phenomenon of central planning of curricula, the curriculum problem is a recent discovery that is best understood by following its progressive revelation.

The specialist field of curriculum development began almost simultaneously in Britain and America in the early 1960s. The launching of the first Sputnik in October, 1957 is often considered to have been a triggering event (Reid, 1975). Responsibility for the loss of the first event in the 'space race' came to rest in an unlikely

place - with secondary school science education. The result was an injection of massive effort into national level science curricula - in America there was PSSC Physics, CHEM study and BSCS Biology; in England the Nuffield Science series. Also in England, the Schools Council was formed to oversee a widespread revamping of the total curriculum in England and Wales. The history of the Schools Council, from early optimism to uncertainty and eventually to a new and less ambitious professionalism, is the history of the emergence of the curriculum problem.

The Schools Council was formed in the early 1960s. In its earliest days curriculum development was seen as no more than project development. Teachers were regarded as alert professionals with a natural interest in ideas that would develop their craft - as indeed they are. Developers assumed that there was an eager audience of potential users, or at least an interested audience of potential users, waiting for the release of each and every curriculum innovation. According to Marten Shipman (1974), curriculum development was believed to involve, "... a scattering of seed in the form of projects in the hope that the ideas produced would germinate, grow and spread". Schools were seen as largely passive and manipulable, although sometimes perversely resistant to change (Papagiannis et.al., 1982).

However, a widespread germination failure was soon evident. Goodlad (1967) pointed to "the formidable gap between the intent of curriculum projects and what actually happens in classrooms". Frymier (1969) lamented that "it seems that most efforts to date have failed or are failing now". The problem was first diagnosed as being due to inadequate attention to dissemination - the

conveyance of the product to the user was at fault in some way (MacDonald and Walker, 1976). Matters appeared to improve somewhat when more attention was paid to spreading the word through the use of demonstrations to teachers and the preparation of teaching materials that brought the philosophy of the innovation into the classroom in an intact form. Nuffield Science projects, which made extensive use of high-quality teaching materials as vehicles for the innovation, peaked at around fifty percent penetration of the user market (MacDonald and Walker, 1976). Numerically, that was a good result.

However, when Becher (1971) analysed the way Schools Council materials were being used in the classroom, a further dimension of the curriculum problem was revealed:

When one looks behind the statistics ... one finds a surprisingly large variation in the methods of use. Far from 'getting the message' implicit in the work of the development team, many teachers have superimposed their own very different interpretation and philosophies.

In particular, Becher found that the Nuffield Science projects had little success in transforming teacher-dominated, content-dominated learning into discovery modes and active student participation. Becher again:

Thus one comes across cases where materials (for example those of Nuffield 'O' level physics) essentially devised to exploit discovery methods are in fact being used in traditionally didactic ways; and others where materials (for instance those for audiovisual language courses) designed to encourage active pupil participation, are being employed largely for passive rote learning.

The full dimensions of the curriculum problem were revealed: First dimension - teachers appeared reluctant to change; second dimension - when they did accept a curriculum change they modified it to suit their own needs (usually those modifications were destructive from

the point of view of the curriculum developer); third dimension - changes in teaching methods were resisted strongly.

Meanwhile, a similar pattern of events was unfolding in the U.S.A. (Herron, 1971), Norway (Dalín, 1969) and U.S.S.R. (MacDonald and Walker, 1976). It was clear that the curriculum problem was not a localised phenomenon.

Why was outdated instruction allowed to persist in a modern, technocratic age? Who was responsible for this widespread failure in the nationally important matter of modernising the curriculum? Suspicion naturally fell on the same parties who, by common consent, were responsible for the failure of the western space programme - the teachers and the schools. Shipman (1974) noted that:

The spread of an innovation involves increasing numbers of teachers who lack the skills and the enthusiasm of the pioneers.... The result is that an apparently successful innovation in the hands of a few can fail when generally adopted and diluted.

In America, the curriculum designer's "posture of condemnation, or at least condescension towards the schools" (Westbury, 1973) resulted in a trend towards 'teacher-proofing' curriculum innovations (Stenhouse, 1975). New curricula were disseminated as 'kits', 'classroom packs', 'audio-visual modules', etc, which the teacher had only to hand out, administer, show, etc and learning would take place.

At the Schools Council, teachers were also seen as the weak link in the chain from developer to student. However, the final response was different. Teacher-proof materials were tried briefly and found not to solve the problem (MacDoanld and Walker, 1976). Instead, the

Schools Council settled on a process model in which curriculum development rested on teacher development (Stenhouse, 1975). There was a shift in emphasis from the preparation of innovatory materials to a process of involving large numbers of teachers in a process of reflection about curriculum and teaching method - a shift in emphasis from preparing the innovation to preparing the user. Later Schools Council curriculum projects placed considerable emphasis on teacher development as the solution to the curriculum problem. It is worth considering an example of a later Schools Council curriculum project to determine the extent to which emphasis on the user has succeeded in overcoming the curriculum problem.

The Humanities Curriculum Project (H.C.P.) is an example of a Schools Council project developed with full knowledge of the curriculum problem (Stenhouse, 1975; Rudduck, 1976; Aston, 1980). It has considerable significance for environmental education - first because of its approach to the curriculum problem; and second because of its emphasis on the examination of controversial social issues. H.C.P. was developed between 1967 and 1970 by a large team headed by the charismatic and controversial Lawrence Stenhouse. The principal 'product' of the project was a pedagogy - distinctive, novel and highly disciplined - by which classroom discussion could be used to explore contemporary social issues. Teachers from any subject background were able to train in H.C.P. methods. In introducing H.C.P. to teachers, Lawrence Stenhouse consistently emphasised that it was up to them to determine what use was to be made of it. Stenhouse would begin teacher re-training courses by saying, "We have nothing to recommend" (cited in MacDonald and Walker, 1976). The discussion pedagogy was

backed by a series of resource units, each dealing with a separate theme and each providing sources of information and opinion as raw material for student-led examination and discussion.

The Humanities Curriculum Project has had very mixed results, both outside and inside the school. According to MacDonald and Walker (1976), H.C.P. was:

soon caught up in an inflationary spiral of rhetorical debate, at its most public when their collection of materials on race was suppressed by the Schools Council in a blaze of publicity. Condemned by N.U.T. [National Union of Teachers] and N.A.S. [National Association of Schoolmasters] spokesmen, cut adrift by the Council ... and assailed variously from the Left ('bourgeois indoctrination'), from the Right ('dangerous revision'), by academics ('ethnic relativism'), and by activists ('substituting social action with a parlour game'), the project was vigorously defended by an equally diverse range of allies, and acquired something of a 'cult' reputation.

The political problems of the Humanities Curriculum Project may have influenced its uptake by teachers. Because of its reception beyond the school, it was clearly a risky enterprise for teachers. Many elected not to become involved. Those who did become involved tended to be mid-career and confident of their craft. Some adopting teachers took up H.C.P. with almost missionary zeal. Jean Rudduck (1976) quotes one teacher as saying, "I see Humanities Curriculum Project as my salvation. If it doesn't work, I'll give up teaching". Despite this level of enthusiasm among some adopters, Barry MacDonald, who was responsible for the formal evaluation of H.C.P., suggests that its outcomes at classroom level were uneven, in some ways paradoxical and eventually quite limited (MacDonald and Walker, 1976).

According to MacDonald and Walker H.C.P. offered teachers dreams that went beyond what real schools are

able to deliver. Many ended up disillusioned. It offered teachers, "a vision of what schools and teaching could become if they started from different premises... a genuine alternative to existing practice, a liberal and potentially liberating ideal". In many instances, however, the realities of the milieu of the conventional school were too strong. Teachers and students could not re-define their role-relationships or their behaviour. Schools proved to be more authoritarian than even they imagined. While some of the adopting teachers broke through to a new level of professional competence, many gave up H.C.P. A few gave up teaching. Those who succeeded tended to be seen by their colleagues as an elite - an exclusive subculture with rigorous membership criteria. That was not what H.C.P. intended. In the final analysis H.C.P. was ignored by many, abandoned by some and taken to heart by a few, who isolated themselves from their colleagues in the process.

The key lessons to be learned from this brief overview of the work of the Schools Council are these four. First, it should be considered normal - and not abnormal - for a curriculum innovation to be either ignored or heavily adapted by classroom teachers, unless the reasons for that response are understood and addressed. Even then, successful externally directed curriculum change may be rare and elusive. The second lesson is that neither of the obvious solutions - the preparation of teaching materials embodying the innovation and the re-training of teachers in the innovation - is an automatic solution to the curriculum problem. The results of the Nuffield Science programmes suggest that the use of teaching materials embodying the innovation increases uptake but invites widespread translation back to the familiar. The Humanities Curriculum Project suggests that intensive

training of selected individual teachers can create an alienated, elite subculture. The unit of change should be larger than the individual teacher. The third lesson is that changes to the traditional pedagogy of the teacher-dominated, content-dominated classroom may be particularly difficult to bring about. A useful working hypothesis may be that changes in how the teacher teaches will only be brought about with difficulty and with training.

However, the most significant lesson to be taken from the work of the Schools Council is that the aspirations of curriculum developers have yielded more than the curriculum problem has. Therefore it has important implications for the Unesco/UNEP program in environmental education, which proposes that a central, internationally developed educational philosophy should influence the intentions of classroom education for all age groups in all countries. One of the implications is that environmental education programmes should be grounded in the best possible understanding of the state of the art in curriculum implementation. This leads me to an examination of the set of perspectives and concepts that frame current understanding of the factors that influence social change in general and curriculum change in particular.

3.3 CURRICULUM CHANGE AS SOCIAL CHANGE

Curriculum developers have sought far and wide for reasons for their continued failure to have a systematic influence on the classroom curriculum. A number of the concepts that are now used to express aspects of both the dissemination of a curriculum innovation and its reception, derive from studies in the social sciences - from sociology in particular. Because of its more general nature it is considered possible that the known principles governing planned social change may help explain events in the dissemination of curriculum innovations. Interestingly, many aspects of present understanding in the field of planned social change show close parallels to the curriculum problem. Consider this example from the sociology literature.

Everett Rogers, to whom I will return later, cites the following example of the implementation of an externally planned social innovation. The original study was published by Wellin (1955). The study took place in the small peasant village of Los Molinos in Peru, where a young female health worker lived and worked for two years, as part of a Government campaign to convince local residents that they should as a matter of routine boil water before consumption. Water-borne pathogens, such as typhoid, were a common cause of illness and death. The campaign involved public lectures on the germ theory of disease and regular visits to every housewife to discuss hygiene matters on an individual basis. Families showing an interest in water boiling were visited with increasing frequency. At the end of the two year programme, 11 families out of the 200 in the village had adopted regular water boiling.

The failure to gain widespread acceptance for water

boiling in the Peruvian village of Los Molinos encapsulates the curriculum problem exactly. We see the innovation as being thoroughly worthwhile and in everyone's best interests. Potential users are assumed to have a similar interest in an advance that will improve their lot. It is introduced with quiet patience and in a rational manner - its advantages are cited and its scientific credentials made known. The message bearer is young, well-trained and thoroughly competent. When the new idea is almost totally ignored by the target group we are amazed and we conclude that they are fools who must be coerced into adopting a technological innovation that is in their own best interests. If it were possible to analyse what went wrong at Los Molinos, we would be on the way to a deeper understanding of the curriculum problem.

I will discuss the Los Molinos example again in section 3.37 We will then have some conceptual tools with which to explore what went wrong.

With respect to the educationally relevant literature on social change, four authors dominate the field - Everett Rogers, Donald Schon, Ronald Havelock and Ernest House. Everett Rogers' three major works dominate the field of the sociology of change. (Rogers, 1962, Diffusion of innovations; Rogers and Shoemaker, 1971, Communication of innovation: a cross-cultural approach; and Rogers, 1983, Diffusion of innovations). According to Ernest House (1979), Rogers is, "...the master synthesiser of cross-disciplinary research on innovation". Donald Schon (1971, Beyond the stable state: Public and private learning in a changing society) considers that learning is something corporations must also engage in. He identifies three organisational models through which

innovations spread - the centre-periphery, the proliferation of centres and the shifting centres models. Schon differs fundamentally with Rogers on several points to do with the spread of innovation. In Planning for innovation through the dissemination and utilisation of knowledge, Ronald Havelock and his co-workers (1971) identify three methodological approaches that institutions have used in the process of attempting to bring about innovation. Havelock calls the three approaches, research, development and dissemination (R,D and D), social interaction (SI) and the problem solver (PS). Finally, Ernest House considers educational change alone and suggests that three frameworks exist from which to examine and interpret the events that shape the reception of a curriculum innovation - the technological framework, the political and the cultural (see House, 1979). Each of the four authors introduced above has contributed concepts or perspectives that are drawn upon by those working in the field of curriculum studies.

3.31 EVERETT ROGERS ON SOCIAL CHANGE

The three authoritative reviews by Rogers encapsulate the mainstream sociologists' views of the process of social change. Central to Roger's explanation is the metaphor that an innovation diffuses through a social system. According to Rogers (1983) there are four main elements that govern the diffusion of an innovation: (1) the innovation itself, (2) is communicated through certain channels, (3) over time, (4) among the members of a social group. He believes that these four elements of the diffusion process are identifiable in every situation involving the introduction of an innovation.

Characteristics of the innovation.

The first element influencing the diffusion process is the innovation itself; or, more correctly, the potential adopter's perception of the innovation itself. Everett Rogers (1983) is emphatic upon this point:

It is the receiver's perceptions of the attributes of the innovation, not the attributes as classified by experts or change agents, that affect their rate of adoption. Like beauty, innovation exists only in the eye of the beholder. And it is the beholder's perceptions that influence the beholder's behaviour.

Evidence for the existence of discrete attributes of the innovation that influence its rate of adoption have been obtained principally from studies of the uptake of educational innovations (See Clinton, 1973; Hahn, 1974 and Holloway, 1977).

Research cited by Rogers (1983) suggests that there are five aspects of the innovation that together may have a significant influence on the rate at which the innovation is adopted:

- perceived relative advantage. The degree to which the innovation is regarded by the receiver as better than the idea it supersedes. The objective advantage of the innovation is not important. The client's perception of it is;
- perceived compatibility. The degree to which the innovation is seen to be consistent with existing norms, i.e., existing values, past experiences and existing needs. Adoption of an innovation that is incompatible with existing values may require prior adoption of a new value system. Changes of this kind are made rarely and with difficulty;
- perceived complexity. The degree to which the innovation is perceived to be difficult to understand and use;
- trialability (Fligel et al., 1968). The degree to which the innovation can be experimented with on a limited basis. All or nothing innovations like the purchase of combine harvesters evoke conservative responses; and,
- observability. The degree to which the results of one adoption are visible to other potential adopters. High visibility stimulates uptake.

The educational studies of Clinton, Hahn and Holloway (cited above) suggest that relative advantage, compatibility and complexity are of primary importance. Trialability and observability appear to be of lesser significance.

Communication of influence.

The second element influencing the diffusion of innovation is the communication of influence through a social network. Once the new idea has received an initial uptake, innovation spreads largely by, "...modelling and

imitation by potential adopters of their network partners who have adopted previously" (Rogers, 1983). People tend to be most influenced by the adoptions of others who they consider to be most like themselves. Rogers believes that the functioning of interpersonal communication networks - which may link individual or groups of individuals - is of central importance to the uptake of change.

However, people vary in their receptiveness to communications about innovation. Rogers (1983) defines five adopter classes - innovators, early adopters, early majority, late majority and laggards. The innovator is characterised by 'venturesomeness' and an attraction towards the hazardous, the rash and the risky. They have extensive networks of contacts beyond their own immediate group. Innovators are not highly respected by their immediate colleagues, and therefore are not socially influential. They are, however, the important gatekeepers through whom the innovation first enters any social network. Early adopters are also key people. Typically they are well-regarded by colleagues and have extensive networks within their social group. Because of their high degree of opinion leadership they are generally sought out by change agents to be local missionaries. The early and late majority form the bulk of the social system. Both groups will deliberate for some time before adopting. In particular, the late majority will deliberate until the weight of system norms favour the innovation. Laggards are socially isolated and without opinion leadership. Often, their precarious situation within the system - as in the financial situation of some farmers - is the cause of their backward-looking, traditionalist views. For reasons to

do with their situation, they cannot afford to make a mistake.

The effect of time.

The characteristics of the innovation and the particular social system through which it is diffusing, combine to create a characteristic rate of adoption. Typically, the result is a sigmoid curve when the cumulative number of individuals who have adopted is plotted against time.

The target group.

The fourth of Roger's elements that influence the diffusion of innovation is the target social group. Important attributes of the social group include its structure, its prevailing norms and the distribution of opinion leadership through its members. The relationship established between the change agent and opinion leaders can also be significant.

Prevailing system norms are an attribute of the social group that can have a considerable influence on the uptake of innovation. Norms are established behaviours, values and needs, together with the past experiences on which they are founded. Any social group has existing needs to which an innovation should be relevant if it is to have any value. If it fails to address purposes that the group members see as being usefully addressed then the innovation has little value to them. If the innovation challenges the validity of existing ways of doing things then it may be seen as fundamentally wrong.

The third attribute of a social group capable of influencing the diffusion of innovation is that of the distribution of opinion leadership within it. Opinion leaders are the custodians of system norms. Their

informal leadership is earned and maintained by the individual's technical competence, social accessibility, and conformity to system norms. They are not necessarily innovative. Their innovativeness depends upon prevailing attitudes to innovation - in a conservative system opinion leaders will be conservative, and vice versa. Typically, opinion leadership is distributed through a group in a highly skewed manner (Figure 3.1). A small number of individuals hold most of the opinion leadership while most members of the group have little or none. In any social group showing reasonable attitudes to innovation, opinion leadership will be concentrated among those who may be classified as early adopters, as I have already discussed. From the point of view of the change-agent, opinion leaders are the primary targets.

The task of the change-agent is to influence the client's innovation decision in a direction deemed desirable by a change agency. As an outsider, often more highly-educated and professional, the change-agent can lack influence within the target social system. The relationship between change-agent and opinion leaders is therefore crucial. Rogers (1983) suggests that effective change-agents use opinion leaders, "as lieutenants in diffusion campaigns".

The role of the change-agent is not to initiate a one-way flow of information from change-agency to client. Change-agents should engage in two-way information exchange in which client-centred issues are brought into the realm of the innovation and innovation-centred issues are brought into the realm of the client system. The long-range goals of change-agents, particularly in decentralised diffusion systems, are to encourage clients first to control their own change-agents, and

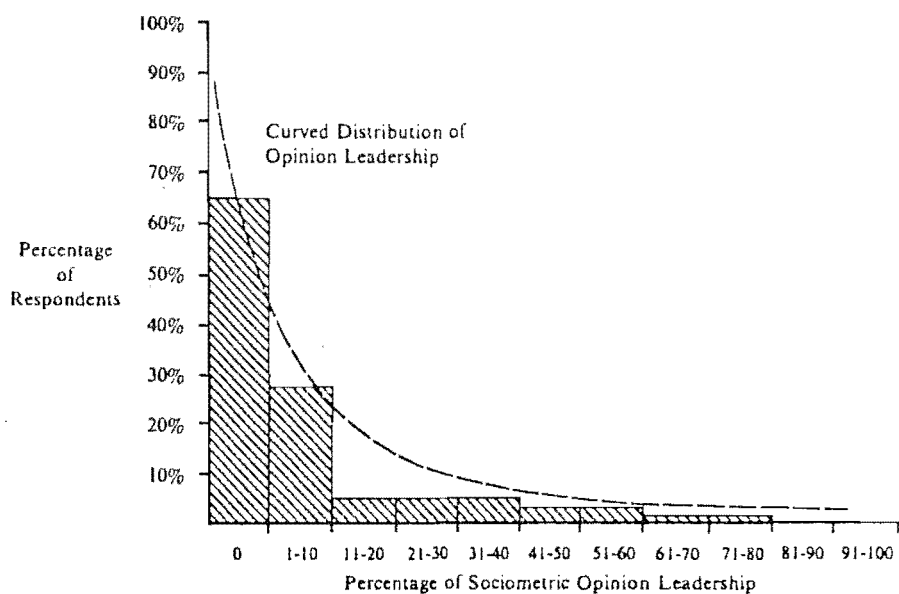


FIGURE 3.1: Typical form of the distribution of opinion leadership through any group. A small number of individuals hold most opinion leadership. Most individuals hold little or none.

then to become their own change-agents. Success in the change-agent business has been found to be closely related to effort expended in contacting clients and to empathy with or orientation towards existing norms in the client system (Rogers, 1983).

Finally, before leaving the sociology literature, two topics of particular relevance to educational change are discussed in more detail. These are the phenomenon called re-invention and the diffusion of innovation through bureaucracies.

3.32 RE-INVENTION

In the sociology-of-change literature, the term re-invention is used to describe the change that an innovation undergoes as new users adapt it to their own particular needs. Educational innovations appear to be particularly prone to re-invention. The process was first described in a study of the use of differential staffing in several American schools (Charteris and Pellegrin, 1972). Everett Rogers sums up the social science literature on innovations, schools and re-invention as follows:

the innovation and the schools engaged in a kind of mutually influencing interaction, as the new idea and the school adapted to each other. Usually, the school changed very little, and the innovation substantially. (Rogers, 1983).

Whether re-invention is a bad thing or not depends upon one's point of view. Change-agents may see it as distortion - even destruction - of the pristine innovation. Adopters, however, universally regard re-invention as positive (Rice and Rogers, 1980) because adapting the innovation to local needs and circumstances increases its usefulness, when 'usefulness' is defined

by the user. Consequently, it is found that adoption with re-invention leads to greater use of an educational innovation than does adoption of an unadulterated innovation.

Several studies have examined factors that contribute to high rates of re-invention (see especially Larsen and Agarwala-Rogers, 1977b; Rice and Rogers, 1980). Three factors appear to have widespread responsibility - uncertainty, flexibility in the innovation itself, and pride of ownership.

The most significant cause of re-invention appears to be uncertainty about the true nature of the innovation. The more difficult the innovation - the more one must know before being able to make it work properly - the more likely it is to be re-invented (Larsen and Agarwala-Rogers, 1977a, 1977b). Similarly, the less the user knows about the innovation the more it will be changed. Contact between the new adopters and both change-agents and already successful adopters is important in avoiding re-invention through ignorance (Eveland et al., 1977). The effects of teacher uncertainty about curriculum innovations will emerge in a later section as a significant cause of implementation failure.

The second principal contributor to re-invention is flexibility in the innovation itself. Obviously, the more the innovation is capable of being matched against

diverse needs, the more it will be subject to re-invention.

Finally, re-invention can result from pride of ownership. Everett Rogers (1983) suggests that it is common in America for a significant educational innovation to be given a 'coat of paint' so that it appears to be a local product. Often, this personalisation is relatively minor. It may involve no more than a change of name.

3.33 DIFFUSION OF INNOVATION THROUGH BUREAUCRACIES

Consideration of the way in which innovations move through bureaucratic social systems takes us one step closer to the classroom. Theories of educational change must pay careful attention to the implications of the heirarchical, bureaucratic social system through which the educational innovation must move. Rogers and Shoemaker (1971) suggest that:

One of the distinctive aspects of educational diffusion is that it occurs in bureaucratic structures. Many more of the innovation-decisions are authority or collective decisions rather than optional innovation-decisions, but most of the past research has treated educational innovations as if they were individually adopted, even though many are not.

What are the implications of the educational bureaucracy for the educational innovation? To begin with, Rogers (1983) points out that bureaucratic organisations have two overlapping kinds of social structures. Influence can be communicated through either or both. The first is the formal arrangement of heirarchical responsibilities which bind people into vertical authority structures. Rogers refers to the movement of an innovation through

the vertical authority structure as 'centralised' diffusion. The second kind of social structure is the informal social networks of horizontal links between people of like occupational status. An innovation moves through the horizontal system by 'decentralised' diffusion. Decision to adopt an innovation can be of three kinds:

- optional decisions (which lead to decentralised diffusion). The choice is made by an individual, independent of other members of the system. Optional decisions spread through the horizontal system;
- collective decisions. All members of a group conform to a consensus decision; and,
- authority decisions (which lead to centralised diffusion). One or a few individuals make the decision to innovate. The innovation is then transmitted vertically to those who are required to implement.

The fastest rate of diffusion is provided by centralised channels. However, the innovation is subject to considerable circumvention and re-invention. Optional decisions produce slower but more reliable diffusion of innovation. Collective decisions are the slowest of all.

3.34 DONALD SCHON: THREE ORGANISATIONAL MODELS FOR DIFFUSION

Donald Schon shares with Everett Rogers the distinction of being a social scientist whose writings on innovation have attracted the attention of educators. In Beyond the stable state: Public and private learning in a changing society (1971), Schon proposes that there are three basic models for the outward spread of social innovation from point of invention to the whole of society. The models are the centre-periphery, in which the innovation originates at the hub of a wheel and diffuses along its spokes to the users at the ends; the proliferation of centres model, in which secondary 'hubs' replace the users at the end of the spokes; and, the shifting centres model in which constant change is the primary characteristic - there is no clearly established centre and there is no stable, centrally-established message. Donald Schon's models have been used frequently to describe curriculum development projects.

Both the centre-periphery and the proliferation of centres models resemble curriculum dissemination projects. The simpler of the two is the centre-periphery model. According to Schon, it has three basic characteristics:

- the innovation exists, fully realised, prior to its diffusion;
- diffusion involves the movement from the initiating centre outward to its ultimate users; and,
- outward diffusion is facilitated by central management, including training and the provision of resources and incentives for adoption.

Schon suggests that this model describes the very

successful turn-of-the-century agricultural extension programs in the U.S.A. Stenhouse (1975) considers that the proliferation of centres model encapsulates most closely the nature of current curriculum dissemination procedures in England. This more elaborate model retains the basic features of the centre-periphery model intact but allocates different roles to primary and secondary centres. The primary centre is the guardian of pre-established doctrine and methodology. It develops the methodologies of diffusion and trains, monitors and manages the secondary centres. The primary centre becomes a trainer of trainers. According to Schon, "the effect is to multiply many-fold the reach and efficiency of the diffusion system".

However, despite their widespread use as the standard approach to the directed dissemination of innovation, Schon argues that both centre dominated structures are prone to breaking down. He also considers them inadequate as methods for securing social change in the complexity of contemporary societies. Not only are they prone to breaking down, but even if they are held together they fail to disseminate innovation. Schon considers their inadequacies to stem from more than their proneness to break down - not only do they often disintegrate, but even if they do not, they don't work.

The sources of failure in both centre dominated models are similar. Schon suggests that both go through characteristic and related life-cycles which end in inevitable failure:

Stage one. A primary centre emerges around an innovation and develops a diffusion system;

- Stage two. Secondary centres develop. The primary centre transforms to the management of both the overall network and the secondary centres;
- Stage three. The primary centre comes under increasing stress due to both the need for more differentiated responses to increasingly varying regional problems and increasing demand for resources; and,
- Stage four. The centre loses control and the diffusion-system fragments. Either the whole system declines or the system transforms into a shifting centres structure.

Even in cases where the centre ensures sufficient resources to remain viable - such as international communism and christianity - Schon suggests that, "the set of secondary centres comes to look more like a family of overlapping and analogous situations than like a set of replications of a single model".

According to Schon, the inadequacies of centre-periphery models for directed innovation stem from their similarity to the beliefs of Everett Rogers, which he considers to be fundamentally flawed - "theories of diffusion have characteristically lagged behind the reality of emerging practice". The central point on which Schon takes issue with Rogers is the notion of the primacy of communication of influence through social systems. Rogers believes that communication of influence is the key vehicle for the diffusion of innovation. Schon accepts that this may be true in the context of a small, benign innovation that largely meshes with pre-existing elements of the target system. More often, he believes the innovation has more widespread significance. In particular, Schon suggests that social systems have a nucleus of "prevailing

technologies and theories around which they are organically built". Innovation touching any aspect of this heartland threatens the system as a whole, in which case, "the process is more nearly a battle than a communication". Furthermore the battle is enjoined over more than the single innovation - it is a radical transformation of the system as a whole that is at issue. Thus it is, Schon suggests, that the unit of diffusion is in many cases a complex of interrelated innovations - a "functional system" - rather than a single innovation. The 'diffusion process' is advanced by battle, not by persuasive example. The view that an innovation may be resisted because it threatens a complex of 'understood ways of doing things' will emerge again later in this chapter.

Schon, therefore, regards both of the centre dominated models as unrealistically over-simplified. He considers that the change process in modern societies is better represented by the third of his models, that of the shifting centres model. This "survival prone" model has emerged from the major social movements of the 20th century - such as the civil rights and nuclear disarmament movements. It is a diffusion model towards which many modern multi-product, multi-branch businesses are evolving. The shifting centres model has three key characteristics:

- it has no clearly established centre. Centres rise and fall around new issues and new leaders;
- there is no stable, centrally established message. The doctrine of the movement shifts, evolves and becomes a family of related doctrines;
- and,

- as a result of the two points above, there is no directed diffusion of a central message.

In effect, Donald Schon is arguing that directed diffusion of educational innovations doesn't work because it cannot work. Centre dominated models are simplistic and failure prone; shifting centres cannot disseminate a message without scrambling it. If Donald Schon is correct then there is little future for environmental education as a series of faithful national copies of an international philosophy.

3.35 RONALD HAVELOCK: THREE METHODOLOGICAL APPROACHES TO DIFFUSION

Ronald Havelock and his co-workers reviewed four thousand studies involving the spread and uptake of new knowledge or information (Havelock et.al., 1971). The largest category of studies involved curriculum dissemination. Criteria for the selection of studies was compliance with a structure in which

- some person or group
- transferred knowledge
- through some identifiable channel
- to some target group
- for some identifiable purpose.

One of Havelock's major aims was to discover any consistent 'models' or methodological approaches by which effective dissemination to the target group was attempted. Three models were identified - the research, development and dissemination approach (R, D and D) the social interaction (SI) approach and the problem solver (PS) approach.

According to Ronald Havelock, the R, D and D approach is found primarily in the context of large-scale change. A need for change is identified by the developer. Considerable attention is devoted to invention, to the production of an effective solution to the developer's problem. The extensive research and development phase may involve rigorous testing and evaluation prior to final release. A packaged solution is then prepared for potential users. In contrast to the emphasis placed on invention, the diffusion phase is largely left to chance, as in the early Schools Council projects. Even in the most highly developed educational version of R, D and D - the so-called Clark-Guba model (Clark and Guba, 1965, cited in House, 1979) - diffusion consists of little more than demonstration of the innovation to potential users. Throughout the R, D and D process, the initiative rests with the developer and the user remains essentially passive. Later versions of educational R, D and D sometimes involved 'mechanisms' for 'installing' the innovation in 'target' groups (MacDonald and Walker, 1976).

Under the S.I. model of change, the sender is still responsible for identifying a need in the user system and for developing a solution. Thereafter, however, dissemination is strongly 'client oriented' - careful consideration is given to such (Everett) Rogerian concepts as opinion leadership, communication of influence through the network of social relationships and group structure. Each member of the group is considered to go through a series of recognisable stages on the way to adoption: awareness (comes into contact with innovation), interest (finds out more), evaluation (mentally tries it out), trial (small scale use) and adoption (routine use) (Rogers, 1962, cited in Havelock,

1971). Change-agents using S.I. models place emphasis on facilitating progress from one stage to the next, primarily by injecting information and by facilitating communication between existing users and potential users. The manner in which information is provided is controlled in relation to the stage reached by the potential user - impersonal (mass media) sources during the early stages and personal contact with adopters during later stages.

The problem-solver perspective is one in which the change process is directed towards solving problems nominated by a specific receiver. The receiver, which may be a person, a school or a school system, is actively involved throughout. While the change process may be initiated by a change-agent, emphasis falls on establishing a collaborative relationship between sender and receiver, known as the change relationship. The change process is often considered to take place in three stages - unfreezing, moving and freezing. Unfreezing involves the receiver in becoming aware of a need in their own environment - not as in the case of the two previous change models, being 'sold' on an external innovation. Moving involves bringing about action. The receiver's problem is first diagnosed or defined as clearly as possible and then a series of action steps are initiated. Typical action steps include standard problem solving events such as establishing priorities, identifying possible solutions and selecting the best alternative solution. Finally, freezing has regard for the fact that after adoption the receiver may have continuing needs, perhaps to 'stabilise' the use of the innovation itself, or perhaps to continue the process of identifying and solving problems.

3.36 ERNEST HOUSE: THREE INTERPRETIVE FRAMEWORKS

In a review paper summarising research in curriculum innovation in the post - Sputnik era, Ernest House suggests that three frameworks have been dominant (House, 1979). The three interpretative frameworks that he considers to have dominated the generation of studies and their interpretation are the technological, the political and the cultural. House considers the technological framework to have been dominant in the early post - Sputnik wave of curriculum innovation but to have lost much favour by the end of the 1970's. That amount of favour that has not been lost, House considers, should have been lost.

House equates the technological framework with the innovation studies of Everett Rogers and the approach to dissemination of the Clark-Guba R,D and D model. Both propose 'systematic' and 'rationalised' models of the change process in which the focus is on the innovation. The adoption of innovation proposed from outside is always seen as positive - 'to be modern is to be innovative'. While House concedes that the technological framework has dominated both curriculum development and curriculum research since the early 1960s, he suggests that in neither application has it worked well. He believes that R, D and D has failed because of its central (and erroneous) belief that, "one can create generalizable and easily diffused products that can be used in a great number of settings, 'a doctrine of transferability'". Even Clark and Guba, he notes, have abandoned R, D and D entirely (Guba and Clark, 1975). Put more simply, he believes that re-invention is necessary. He cites Everett Rogers (1975) as suggesting that the innovation research framework he (Rogers) engendered has not been all that innovative, because of its pro-innovation bias and its lack of attention to

social processes. However, it is not always easy to reconcile House's summaries of Roger's position with Everett Roger's summaries of his own position.

The second of Ernest House's interpretive frameworks is his own political perspective (House, 1974). Politics is considered to involve those processes through which members of society seek to assert and to reconcile their wishes (Kogan, 1978). From this standpoint, the problems involved in securing the success of an innovation are best understood from a political perspective. Innovation initiates a series of conflicts and compromises between the principal actors - advocates, developers, teachers, teacher unions, administrators, parents, even governments - as they compete for resources and influence in attempts to control each other and their own numbers (MacDonald and Walker, 1976). The failure of much curriculum innovation is therefore explicable in terms of forces working at a political level. Greenall, (1981) explains the failure of environmental education in Australia from a political perspective. From the political perspective diffusion of innovation can be enhanced by attention to those political forces.

As example of the maxims that emerge from political analysis of educational innovation, House (1979) cites the following:

- teachers have few incentives for innovation and many disincentives. Benefits accrue to those near the top of the innovation bureaucracy and burdens accrue to those at the bottom - i.e., to those who must implement (Westbury, 1973);
- innovation succeeds only where advocacy groups arise to support it (House, 1974). The task of the advocacy group is to secure resources and to

provide social rewards; and,

- mutual adaptation between the change-agency and the school is the key to successful implementation of external innovations (Greenwood et al., 1975).

House considers these observations and statements of beliefs to be examples of concepts that are fundamentally political in nature. As a result, he suggests that the political framework, "now contends with the technological perspective for dominance as an interpretative framework" (House, 1979).

The third and final of the interpretive frameworks that Ernest House considers to have dominated studies of educational innovation is the cultural perspective. According to Stenhouse (1967), culture involves a complex of shared understandings which serve as a medium for human interactions. Cultural studies of educational change involved 'consciously anthropological' approaches in the style of the pioneering work of L.M. Smith (Smith and Geoffrey, 1968; Smith and Keith, 1971). Emphasis is placed upon defining both individual roles and the ecology - like network of role-relationships within the social-cultural setting of the classroom, the school and/or the community, depending on the scope of the study. The innovation itself is considered to have a 'culture', at least part of which is the culture of its inventors. There is an inevitable gap between the culture of the innovation and the culture of any group that must interpret, absorb and then transmit onwards the culture of the innovation on its way to the classroom (Rudduck, 1977). The result is progressive modification of the culture of the innovation. In the face of an imposed, and therefore culturally incongruent innovation, teachers re-assert the most basic elements of the culture

of teaching (Wolcott, 1977):

- teachers are autonomous ("I don't have to do it if I don't want to");
- teaching is sacrosanct ("What I do now is very important");
- only teachers understand teaching ("I know what I am doing");
- teaching has traditions not easily changed ("I've been here longer than you have"); and,
- teachers are vulnerable ("What are you trying to do to me?").

The net result is that the culturally incongruous innovation leaves the system much as it was before.

When they are viewed together, House regards the three frameworks as forming a logical progression - from the technological, which focuses on the innovation; to the political which focuses on the innovation-in-context; to the cultural which focuses on the context. House summarises his 'perspective on the perspectives' as follows:

The earliest version of the technological perspective assumed that there was considerable social consensus, substantial value integration. It focused on the innovation because it assumed that everyone was pursuing a common end and that the context was not a problem.

The political perspective suggests that all is not harmonious. There may be problems, value conflicts. Not everyone wants the same thing. Opposing factions will have to bargain and compromise, resort to political devices. Conflict is not only possible, but probable.

The cultural perspective assumes a more fragmented society, more value consensus within groups but less consensus among social groups so that groups must be regarded as subcultures.... They must be approached cautiously as one would approach foreign cultures.

The prospect of progress with curriculum innovation appears differently from each framework. From the technological stand-point, it is all right to proceed aggressively since the idea of progress is considered to be shared by all. From the political view, progress is seen to be possible but problematic, since conflict, negotiation and compromise will be necessary. However, from the cultural perspective the possibilities for misunderstandings between the culture of the innovation and the culture of the receivers are both considerable and unknown. Curriculum change, therefore, is expected to be a halting and uncertain enterprise.

3.37 LOS MOLINOS REVISITED

The several interpretations of the factors involved in social change form a series of overlapping explanations for the same set of issues. In effect, each interpretation views directed social change from a different angle. The explanatory power of the interpretation also varies. It is useful, before proceeding with this review, to examine the explanatory power of each of the major paradigms in the context of a single example of directed social change.

In the introduction to section 3.3, I cited the case of a spectacularly unsuccessful attempt to bring about planned change in the Peruvian village of Los Molinos. After two years of instruction and persuasion, only around five percent of families took up the boiling of drinking water as a way of avoiding illness and death from water-borne pathogens. The question of what actually happened at Los Molinos was closely examined by Wellin (1955), and his explanation provides an interesting test-bed for the several change paradigms.

Explanations for the factors that contribute to the success or failure of directed social change tend to fall under four headings: features of the innovation; features of the potential users; the gaining of social sanction for the innovation; and, the process of bringing together the innovation and the user. Features of the innovation did not appear to exert a strong influence on the events at Los Molinos; each of the others did.

The innovation and the village people were brought together by a Government-sponsored, country-wide programme to reduce illness and death from water-borne disease (Wellin, 1955). The programme was a classic example of what Schon (1971) calls centre-periphery, and what Havelock (1971) calls an R, D and D model. It was both centre dominated and innovation centred. The R, D and D model for change is considered to be failure-prone because it is too innovation oriented, and lacks a means of incorporating user needs. A failure to consider relevant features of the potential users appears to have been one of the principal failures at Los Molinos.

Several of the paradigms introduced in the review of the change literature suggest that there are important aspects of the potential users themselves that influence the uptake of innovation. Everett Rogers (1983) calls these, "existing norms", Schon (1971) identifies what he describes as, "prevailing technologies and the theories around which they are organically built". Ernest House (1979) prefers the term, 'culture' to describe the existing network of understandings and role-relationships in the user group. I also find the notion of 'culture' to be the most useful description of this feature. From this viewpoint, one of the key problems at Los Molinos was a clash between the culture of the innovation and the

culture of the village.

Wellin (1955) suggests that the government health worker was quite unaware that the village people already had health reasons for their existing practices. According to the existing culture, boiled and unboiled water should be drunk according to the state of one's health - sick people drank boiled water if they wished to get well and well people drank unboiled water if they wished to stay well. Lectures on the germ theory of disease, which were not understood, did nothing to dispell established beliefs. They did establish in a very public way the clash between the culture of the innovation and the culture of the village. Further, the cultural view of social change suggests that cross-cultural dialogues often result in misunderstandings. Given that the health worker's stated reason for her enthusiasm for visiting homes was judged to be absurd, village women invented their own explanation. She was a 'government snoop', a 'dirt inspector' who had come to report on them. This interpretation of her presence spread among the village women through a network of social influence that the health worker had failed to tap into.

The final heading under which aspects of social change can be considered is that of the gaining of social sanction for the innovation. I have already introduced Rogers' conclusions regarding the influence that opinion leadership has on the uptake of innovation, Rogers (1983). A failure to recognise the need for the gaining of social sanction appears to have been the second key problem at Los Molinos.

The failure to identify the opinion leaders among the village women and to use their social network was the

health worker's second mistake. She was an outsider. She was also socially and educationally separate from the women she sought to influence. As a result, it was essential that she should both recognise her own lack of social influence within her target group and identify and recruit village opinion leaders to her cause. Unfortunately, the early adopters among the village women were all entirely without opinion leadership - either they were on the social periphery or they were complete outcasts seeking approval from someone. Not only did these early recruits lack social connections through which to communicate influence, but the high visibility of the change project among village women meant that as soon as their participation was known, non-participation by the social mainstream was confirmed.

My conclusion from this brief examination of the Los Molinos case study is that the perspectives and concepts that have emerged from the studies of social change provide a conceptual framework implementation failures of the same general kind as those observed in curriculum studies.

3.4 THE IMPLEMENTATION STUDIES

The studies introduced so far have regarded curriculum change as a special case of social change. Their implication is that the curriculum problem is no more than a particular example of the problems inherent in any form of externally-directed social change - the school as a pedagogical Los Molinos. However, there is another group of studies that see the classroom setting as being in several ways quite unique. It is sometimes argued (Reid, 1975; Fullan and Pomfret, 1977) that there are a sufficient number of unique barriers to change operating at classroom level to explain the curriculum problem. In

fact, the barriers proposed under this heading are not unique. However, their uniqueness is not the central point. Their significance is.

As one might expect, the volume of literature on implementation in education is considerably less than that on the sociology of change. The implementation studies are well covered by two reviews: that of Kritek, (1976) Lesson from the literature on implementation; and Fullan and Pomfret (1977) Research on curriculum and instruction implementation.

Implementation studies tend to focus on two aspects of the curriculum in the classroom - the teaching method(s) by which the curriculum is presented and the attendant classroom role relationships. The latter refers to the behaviour associated with the roles of teacher and students, and the way teacher and students think about themselves and one another (Fullan and Pomfret, 1977). Implementation studies often hold a particular interest in explaining why certain teacher-centred, instruction-based patterns of learning persist in the face of such concerted and sustained efforts by curriculum developers to replace them.

The review material that follows is used to develop the argument that there are two 'unique' barriers to change operating at classroom level. The first is the effect of innovation on the teacher's primary occupational goals of class control and achievement. The second is the fact that 'the innovation', i.e., the full set of changes required in the teacher's thinking, understanding and behaviour, is rarely made clear to teachers. I will argue that these barriers are sufficient to account for a much of the indifference and adulteration that are the

fate of many curriculum innovations. In other words, it is my view that curriculum developers qualitatively and quantitatively underestimate the change required of classroom teachers.

3.41 CURRICULUM CHANGE AND CLASSROOM MANAGEMENT

The first of two unique barriers to change operating at classroom level lies in the nature of classroom teaching itself. I intend to argue that, properly understood, the classroom is a difficult place to change because of the demands placed on teachers and the way they respond to those demands. The effect of the occupational demands of teaching is such that any change which affects key elements of the classroom situation de-skills either the teacher, or the students, or both. I will suggest that teachers avoid being de-skilled because the result is an escalation in the difficulty with the maintenance of both control and achievement. Like a hydrofoil, a class offers least resistance when the teaching-learning process is moving briskly along (Kounin, 1970). Let it slow down too much and the effort needed to move it at all becomes too great for teachers. There is evidence that teachers also avoid de-skilling students because of its direct effect on achievement (Shipman, 1974).

The classroom teacher has three essential tasks (Westbury, 1973):

- to establish a suitable climate for good learning (which essentially means motivation and control);
- to present that which is to be learned; and,
- to organise student activities by which learning may occur.

These three tasks combine to place heavy demands upon the

energy and commitment of teachers. The energy output demanded by conscientious teaching is not always appreciated by the inexperienced.

Of the three tasks noted above, the establishment of a climate for learning is the teacher's first task. As a result, establishing and maintaining a necessary degree of class control is always an important element of good classroom practice. For some teachers maintaining control is an overriding concern. To a greater or lesser degree therefore, teachers use strategies for achieving the second and third of their three essential tasks that simultaneously minimise control problems. Ian Westbury (1973) refers to these control-maximising pedagogical methods as coping strategies. He defines a coping strategy as a teaching technique that

secures some task attention, gives some measure of control over the activity of students, facilitates coverage of content, and offers a drill and practice situation that leads to some, albeit more often than not a nominal, mastery of the facts that carefully tailored tests require as the symbols of school learning.

Westbury's view is a little condescending, but his point is sound: Teaching is demanding; teachers make extensive use of coping strategies to satisfy simultaneously the full range of classroom pressures.

Teachers' classroom coping strategies can be remarkably subtle (Smith and Geoffrey, 1968) but I wish to focus here on two of the more general ones that I know to be pervasive in New Zealand classrooms - textbook teaching - which is known in America as 'seat work' -and 'the recitation'. Teaching strategies in which the business of the classroom is dominated by students working through exercises from a textbook provides a number of coping advantages for teachers. It minimises teacher

preparation - there is no problem providing materials or exercises; students know what to do now and what to do next; and, the teacher is free to circulate, to be close, to assist, to control (Smith and Geoffry, 1968). Textbook teaching is therefore an effective coping strategy, even if it is not an effective learning strategy. The same argument can be applied to 'the recitation'.

A second effective way for teachers simultaneously to satisfy the demands of controlling, motivating, presenting and ensuring that learning is occurring, is through what in the American literature is called, 'The recitation' (Gump, 1971; Westbury, 1973). 'The recitation' involves combined verbal and blackboard presentation, interspersed with frequent questioning of students - 'chalk and talk' in New Zealand parlance. 'Chalk and talk' has many advantages for the teacher - the whole class can be seen at once; it maximises the involvement of all students in the lesson; students who appear to be losing interest can be 'taught at' or questioned; and, it minimises the organisational demands on the teacher. 'Chalk and talk' is so useful to teachers that Hoetker and Ahlbrand (1969) say of it:

The studies that have been reviewed [in the paper] show a remarkable stability of classroom verbal behaviour patterns over the past half century, despite the fact that each successive generation of educational thinkers, no matter how else they differ, has condemned this rapid-fire, question-answer pattern of instruction.. What is there about the recitation.. that makes it so singularly successful in the evolutionary struggle with other, more highly recommended methods?

My answer is that 'the recitation' is an important coping strategy. As such it provides a range of advantages not possessed by its proposed replacement.

A loss of learning momentum may also contribute to the resistance towards change. Jacob Kounin (1970) examined the influence of teacher style on children's behaviour in learning settings. One dimension of style examined was that of the maintaining of movement and progress in classroom tasks. Kounin used the terms 'smoothness' and 'momentum' to refer to aspects of the way in which the business of the classroom was kept going. Smoothness was regarded as an absence of teacher actions that stop/start the flow. Momentum had to do with the rate of flow of activity. Kounin reported that:

... one must conclude that the dimension of movement management, including both smoothness and momentum is a significant dimension of classroom management. Within this dimension it is more important to maintain momentum by avoiding actions that slow down forward movement than it is to maintain smoothness by avoiding sudden starts and stops.

Thus 'the shock of the new' may impede momentum to such an extent that the new is rejected. The introduction of something genuinely new may result in a loss of momentum, which a teacher may feel an obligation to overcome by veering back towards old ways. Students may also resist the unfamiliar by a determined show of uncertainty.

The central point here is this: For the teacher, both instructional method and teacher-student relationships are central components of hard-won professional competence (Reid, 1975). Any innovation that requires the teacher to change either of these components - and most modern curriculum innovations prescribe changes to both - de-skills the teacher, resulting in a temporary loss of classroom competence (MacDonald and Walker, 1976) a loss of forward momentum (Kounin, 1970), a corresponding increase in the demands on the teacher, and a loss of achievement on the part of students. Marten

Shipman (1974) notes that:

Only the teachers in the classroom can implement changes in the curriculum. But every change in routine is a threat to teacher-pupil relations and to standards of work.

As a result, most teachers will avoid significant change in classroom methods for instruction and control. Changes in content alone may be accommodated more easily. When any kind of change is proposed the innovation undergoes a transformation in which those aspects that are compatible with existing methods for conducting the business of the classroom are taken in and the remainder are left outside the classroom door. Reynolds (1973) calls this process, "assimilation to the familiar". It may be better represented as 'assimilation to the functional'. In his case study of the Schools Council Integrated Studies project at Keele, Marten Shipman (1974) defends teachers against charges of conservatism:

There may.. be very good reason for resisting innovation. Throughout this project worry over standards of work persisted. This was no mere excuse for inaction but a genuine concern for the children, which was again prominent when teachers looked back over the years of the trial... To more distant [evaluation] teams [this resistance] would have looked like conservatism.

3.42 THE OBSCURE INNOVATION

The second major barrier to change that emerges clearly from the studies of educational implementation is that of obscurity - the innovation is not clearly disclosed or fully disclosed to the teacher. Several authors have identified teacher uncertainty about the innovation as a significant source of inadequate implementation (Gross, et al., 1971; Charteris and Pellegrin, 1972; Kritek, 1976; Fullan and Pomfret, 1977). Kritek talks about the "tendency of.. programme planners to write vague and abstract statements of a programme's goals and of the means towards those goals". Charteris and Pellegrin point to "the fallacious assumption that a statement of general, abstract programme values and objectives will easily be translated into new and appropriate behaviour patterns at work". Lofty obscurity appears to be a characteristic of the curriculum designer's art in more than one country.

Fullan and Pomfret (1977) suggest that there are at least five dimensions of the business of teaching that may be affected by an innovation. Their five dimensions are these:

- the subject matter or content that is to be taught;
- role/behaviour. This includes instructional method and the associated role relationships with students, other teachers and school administrators;
- structural changes, which include alteration to requirements for physical condition and materials;
- background information. The philosophy, values and wider implications of what is taught may be changed by innovation; and,
- teacher values. The philosophy and beliefs

about the world held by the teacher may be changed, or at least challenged by the innovation.

Properly understood, therefore, 'the curriculum innovation' is the change required of teachers under each of these headings. A fully specified innovation is one in which attention has been given to identifying and setting down the key changes required under each of the headings above. As I see it, specifying the innovation does not involve 'scripting' the teacher. It does involve making clear the full range of changes in the business of the classroom required by the innovation.

A second feature of the innovative curriculum that contributes to the obscurity problem is that of difficulty - either as a result of innate and unavoidable features of the innovation, or as a result of a curriculum designer's "perverse incentive to inflate aspirations" (Carpenter-Huffman et al., 1974). Difficulty and obscurity interact (Fullan and Pomfret, 1977) to increase the uncertainty teachers face in interpreting the curriculum innovation. Fullan and Pomfret suggest that:

..researchers and practitioners in change situations should be oriented to addressing continuously the programme explicitness and degree of complexity of educational innovations that they are attempting to use.

However, it is important to emphasise that the notions of both obscurity and difficulty relate to the teacher's perceptions, not the developer's. 'The innovation' is what teachers see as being different from that which already transpires as the work of the classroom.

3.5 A CHECKLIST MODEL OF CURRICULUM IMPLEMENTATION

It is clear from the material introduced in this chapter that curriculum change of the kind required by environmental education will not be easy to bring about. On the basis of the material introduced here, environmental education appears to have a number of characteristics that suggest implementation is likely to be even more difficult than it is in the context of a more ordinary curriculum change. In particular, environmental education challenges the state of the art in curriculum implementation in three areas:

- the change required of teachers goes beyond a change in the content of classroom instruction (teaching ABOUT the environment). It involves a significant change in the culture of the classroom, in the sense that established role-relationships and ways of proceeding must change. 'Coping strategies' will need to be abandoned and new pedagogical competencies found;
- there is limited scope for 'mutual adaptation' between innovation and user. Environmental education requires fidelity to a central set of values (something I will argue in chapter four) and a central set of non-cognitive objectives (problem solving and action). I will argue in a later section that in practice this will mean fidelity to a central pedagogy, in the same manner as the Humanities Curriculum Project; and,
- environmental education raises questions accepted beliefs about the purposes of schooling. It requires that students become involved in controversial social issues and that they carry concern through to action. Environmental education therefore requires public sanction, because

curriculum is a public matter (see chapter two in Stenhouse, 1975). This matter is also taken up in more detail in the next chapter.

Because of these particular difficulties the implementation of a curriculum in environmental education should be regarded as more than usually problematic, and success as more than usually uncertain. If successful implementation is to be achieved, it will require a more than usually effective implementation model. By agreement, no implementation method exists (Hirst, 1975) by which an educational idea can be transformed with certainty to the required classroom practice. Much of what stands for curriculum theory consists of conflicting explanations for observed failure. Environmental educators will have to become very good at doing the best that can be done with present understandings of the curriculum implementation process. Careful attention to implementation matters should be an explicit part of curriculum building in environmental education.

In the absense of a certain method of bringing about curriculum change, one must do one's best - what Hirst (1975) calls, "...development on the spot, using all the available understanding and knowledge". It seems clear from the material introduced in this chapter that there is a diversity of views on social change in general and on curriculum change in particular. However, there is not an equivalent diversity of phenomena involved. A finite number of influences on the implementation process have been described from a range of different stand-points, in several different settings. I do not wish to examine the overlap between alternate explanations as such. Instead I propose to distill out of the review presented here the key influences that I see acting on

the success of the implementation process. The distillate will be in the form of a checklist of essential implementation issues. It has been assembled from the perspective of environmental education. The checklist suggests that there are four principal groupings of influences on the success of implementation: features of the innovation; features of the user; the bringing together of user and innovation; and, the gaining of social sanction for the innovation.

A. Features of the innovation

The curriculum innovation is what is new and different from the perspective of the teacher: "...innovation exists only in the eye of the beholder" (Rogers, 1983).

1. Compatibility with the existing classroom culture (typically teacher-dominated, subject-dominated instruction involving widespread use of coping strategies). Moves toward new kinds of shared understandings are difficult to bring about. They will not be achieved by all teachers; they require careful attention to A2 below and B1 and good support for teachers.
2. Clarity of specification. The total range of change required should be identified in all significant dimensions of the culture of the classroom.
3. Simplicity. The classroom deals in simple ideas. The simplicity in an innovation should be revealed, so that teachers do not have to go looking for it.
4. Reason for change. Real change in the culture of the classroom is demanding on teachers. The innovation must supply the teacher with a reason to

take up those demands, by meeting an existing need. Change that is required (as in a national curriculum change) but which meets no needs of the teacher's will tend to be reduced to trivial change of content, so that the effort in implementing the change becomes commensurate with the perceived value of change.

B. Features of the user

Both the school and the classroom have a culture that students and teachers must participate in. The culture of the conventional classroom provides teachers with a way of achieving a range of professional and personal goals (including survival). Content aspects of the classroom curriculum can be changed with relative ease; cultural aspects can be changed only with difficulty.

1. Users hold a set of existing norms (Rogers, 1983) - values, experiences, beliefs, needs - with which the innovation must be compatible. These should be sought out and built into the innovation.
2. Users vary in their receptiveness to change. Early, middle and late adopters require different recruiting strategies.
3. Users vary in their usefulness to the innovation. Schools, and even school systems have opinion leaders whose conversion produces a multiplier effect.

C. The bringing together of innovation and user

The implementation of environmental education requires fidelity to a central philosophy (problem identification, problem solving, remedial action). Diffusion models must therefore be of the centre-periphery or (better)

proliferation of centres types so that the purity of the message is safeguarded.

1. Schools provide two discrete networks for diffusing change - a horizontal, decentralised network of colleagues and a vertical, centralised network of bureaucratic responsibilities. The former allows slower movement through the modelling of success. The latter brings about rapid dissemination but more circumvention and trivialising.

2. Innovation in content can be disseminated effectively through classroom materials - textbooks, audio-visual packages, etc.

3. Innovations in the culture of the classroom require the re-training of teachers. Those who retrain the teachers (the 'change agents') should be imbued with the culture of the classroom to avoid misunderstandings between the culture of the innovation and the conventional classroom culture. (Cross-cultural communication often leads to misunderstanding).

D. The gaining of sanction for the innovation

Innovations that involve significant change in the purposes of schooling can expect professional and public controversy. A change in one part of the culture of the school will threaten other teachers who will resist that change. A change that implies a revision of the purposes of schooling will be resisted by the guardians of established social doctrine. The metaphor for significant educational change is that of battle (Schon, 1971).

Innovations persist only where advocacy groups

arise to support them. Environmental education must have friends and supporters if it is to survive.

3.6 CONCLUSION

At the end of chapter two I expressed concern that the educational intentions of environmental education may be beyond the capabilities of schools and teachers in the real world: Saving the world is a demanding assignment for institutions that continue to have difficulty teaching students to read. Those concerns have not been dispelled by this review of the state of the art in curriculum implementation. Curriculum researchers agree that the fate of curriculum innovations fall on a continuum between total success and total failure; often close to total failure (when viewed from the developer's stand-point). Experience suggests that the more fundamental the change required by an innovation, the greater the conflict with the guardians of established doctrine, and even assuming that some degree of sanction is gained, the less the chance of ultimate success in changing the classroom curriculum. Against this must be set the observation that the total range of change required by environmental education is greater than for any other development proposal I know of. Given these realities, some urgency should be attached to evaluative studies capable of determining the reality of the achievements of existing programmes in environmental education.

Clearly, there are grounds for pessimism. There are also grounds for hope. Environmental education is not the only curriculum philosophy to seek changes in both the culture of the classroom and society's view of the

purposes of schooling. Two programmes that have are the British Humanities Curriculum Project (op cit) and the American Man: A Course of Study (Inglis, 1975). Both HCP and MACOS share important philosophical characteristics with environmental education. During implementation, both had to withstand controversy that spilled out of the schools and into society - and in the case of MACOS, into the courtroom - as elements within society debated new views of the purposes of schooling. Consequently, both were passed over by the more conservative schools and teachers, and only taken up by the more innovative. Most significantly, however, both were successful in reaching some classrooms in the form that their designers had intended. I regard it as no co-incidence that the only two environmental education-like curricula to achieve at least partial success were the product of development teams headed by curriculum researchers - Lawrence Stenhouse and Jerome Bruner.

It is my argument, therefore, that curriculum development and dissemination in environmental education must be firmly grounded in the best available understanding of the curriculum implementation process. I know of no evidence suggesting that this has been done to date. The checklist of issues presented here is an attempt to begin that process.

CHAPTER FOUR

A NATIONAL FRAMEWORK FOR ENVIRONMENTAL EDUCATION

Education becomes environmental when it adequately reflects the environmental problems and issues of society in the local, national and global contexts.

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Prophets may teach private wisdom: Teachers must deal in public knowledge.

Lawrence Stenhouse (1975)

4.1 INTRODUCTION

In chapter two, the term 'framework' was used to refer to the environmental perceptions and associated problems that are given expression in an environmental education programme. It was suggested there that the development of a national framework was one of the three key parts of a national strategy for environmental education. According to the Belgrade Charter, each society must "clarify for itself" (Unesco, 1976) its own environmental problems and priorities for action. A second, and related, key part of a national strategy was suggested to be a content definition, which describes, 'that which is to be taught'. The need for careful formulation and clear statement is emphasised by the previous chapter on the uptake of curriculum innovations. The changes to conventional classrooms required by environmental education are substantial and unlikely to succeed without clear and careful fomulation of the innovation.

This chapter takes up the question of a national framework and an associated content definition. It takes up both of these along with the caveat from the previous chapter: environmental education must be made as clear as possible to teachers if it is to have any chance of implementation without distortion. The two primary objectives of this chapter, therefore, are to develop and justify a New Zealand framework and content definition, both of which are to be expressed in the language of the classroom. I have in mind for both, formulations that are more specific than those of the Belgrade Charter (Appendix 2A; Unesco, 1976). A third objective will be added to these two after a more detailed discussion of the nature and origins of 'environmental problems'.

4.2 ENVIRONMENTAL EDUCATION AS A CURRICULUM ABOUT ENVIRONMENTAL PROBLEMS

The philosophy and content of any school curriculum should reflect the essential nature of the discipline of knowledge from which it is derived (Brunner, 1960). The essential nature of the discipline called environmental education is to do with environmental problems and their solutions. The framework and content of a national curriculum in environmental education, therefore, should be built out of environmental problems facing that society, in the local, national and global frames. A national programme in environmental education should consist of a set of environmental problems, with justifiable relevance to that society, together with pedagogy for approaching them in a problem solving way. To frame a national environmental education strategy in any other way would result in it reverting to education ABOUT the environment, or IN the environment, rather than

FOR the environment (Lucas, 1972). The failure to retain a focus on environmental problem solving is regarded as one of the key problems with existing programmes (Greenall, 1980).

However, approaching environmental education as a curriculum about environmental problems leads to a serious difficulty, in my view. The difficulty is that an environmental problem is a value judgement - it exists only because some person perceives a disparity between the actual world and their own ideal world. Asked to nominate an environmental problem, I might express my concern about the difficulties that face Polynesian people in New Zealand society. Another person might express the view that Polynesians are responsible for most of the incidents of rape in New Zealand. Which of us is entitled to expect our values, expressed in the form of problem statements, to be built into a national curriculum in environmental education? The quotations from Robert Stenhouse and Victor Johnson at the beginning of this chapter establish the tension clearly: environmental education is about problems that some people perceive, but schools deal in socially validated knowledge, not in private views of the world. Scheffler (1958) and Reid (1979) make the same point.

If a curriculum in environmental education is to be built around environmental problems, then the selected problems should be subject to the same standards of examination, criticism and justification as the content of other school curricula. Since appeal to a panel of disciplinary experts is the standard method of selecting and justifying content for a conventional curriculum (Tyler, 1949; Stenhouse, 1975) I propose that a parallel method should be applied to the selection of

environmental problems for a national curriculum in environmental education.

In the material that follows, I will develop further the proposition that the environmental problems for a curriculum in environmental education should be based on the judgements of a group of environmental experts: those who know most about the New Zealand environment. The consulting of a group of people regaining their environmental perceptions suggest that the research task involves social survey. It also suggests that some difficult questions are involved to do with the origin and nature of value judgements about environmental problems. I wish to examine these questions more closely before approaching the design of a social survey experiment.

4.21 ENVIRONMENTAL PARADIGMS AND ENVIRONMENTAL PROBLEMS

An environmental problem exists when some person articulates a disparity between the actual and the ideal world. I will propose here the hypothesis that a judgement of this kind arises out of an environmental paradigm, by which I mean a more-or-less consistent way of viewing the relationship between people and the environment. Potentially, there may be many environmental paradigms held by different people in society. A given paradigm can be expected to reveal a particular set of problems, more-or-less regardless of who holds it, since it can be regarded as functioning like a window through which a person views the real world. Another paradigm might reveal another set of issues. Experimental evidence is developed later in this chapter that has a bearing on this hypothesis.

The sense in which I use 'paradigm' here derives from that of Khun's (1962) work, The structure of scientific revolutions. Working as an historian of science, Khun introduces the notion of a paradigm as a 'coherent tradition of scientific research' which binds the group or community who share it to the same set of rules and practices. In particular, Khun notes that:

..one of the things a scientific community acquires with a paradigm is a criterion for choosing problems... To a great extent these are the only problems that the community will admit as scientific or encourage its members to undertake. Other problems... are rejected as metaphysical, as the concern of another discipline, or sometimes as just too problematic to be worth the time. A paradigm can, for that matter, even insulate the community from these socially important problems that are not reducible to the puzzle form, because they cannot be stated in terms of the conceptual and instrumental tools the paradigm supplies.

Khun's use of 'paradigm' to describe a self-consistent set of scientific beliefs is similar to the anthropologists' use of the term 'culture' to describe a set of shared language, beliefs, traditions and ways of proceeding (Keesing and Keesing, 1968).

My argument here is that the idea of complex judgements arising out of an underlying paradigm can be applied as well to the environmental sphere as it can to the scientific. Khun sees a given scientific paradigm as being normative - it leads to the identification of a set of 'worthy problems' (while rejecting all others) and nominates how they should be solved. Equally, I believe that an environmental paradigm can be expected to identify and endorse as worthy some environmental problems, to identify and reject as unworthy another set of problems and to fail to identify yet another set. An environmental paradigm can also be expected to nominate how the worthy problems in its associated set can be

solved. If there is such a thing as an environmental paradigm that represents the beliefs and aspirations of the philosophy called environmental education then it would be useful to have it out on the table, because it may represent the clearest statement yet of what environmental education sets out to inculcate.

The third objective of the study that follows is to examine the hypothesis that environmental problem statements characteristic of environmental education arise out of an underlying paradigm.

4.3 THE RESEARCH PROBLEM AND ITS SURVEY DESIGN IMPLICATIONS

I have suggested that a curriculum in environmental education should consist of a set of local, national or global level environmental problems, with justifiable relevance to that society, together with a pedagogy for approaching them in a problem-solving way. Because environmental problems are themselves value statements, and because a curriculum is a public matter requiring public sanction, I have also suggested that environmental problems for environmental education should be discovered by consulting an appropriate group of experts - just as material for a conventional curriculum may be discovered from a group of disciplinary experts. If a curriculum is to be based on judgements about the state of the world, those judgements should be grounded in the best understanding available.

I have established three objectives for the research that follows:

- the identification of a framework for a New Zealand environmental education strategy. By 'framework' I mean a philosophy expressed as

environmental perceptions and associated problem statements;

- the distillation from the framework of a content definition, by which I mean a statement of 'that which is to be taught'. The content definition should be expressed in the language of the classroom; and,

- the testing of the hypothesis that environmental problem statements of the kind characteristic of environmental education arise out of a paradigm.

The three objectives outlined above are capable of being resolved by means of social survey of an appropriately selected expert group. For a number of reasons that will emerge in the following discussion, the survey task is a particularly complex one. In character it is primarily exploratory and/or descriptive rather than confirmatory (Weisberg and Bowen, 1977). It seeks both to discover certain judgements held by a certain kind of person and also to reveal the basis on which those judgements were made. Social research of an exploratory nature is freer of rules of procedure than is confirmatory or hypothesis testing research. It may involve more innovative techniques that are justified by their logical reasonableness (Eckhardt and Ermann, 1977). However, part of the research task is confirmatory in that support is sought for an hypothesis to do with the presence of environmental paradigms. Certain checks against bias and nonsense are also needed, as the discussion below will establish. Both hypothesis testing and error checking should be based on firmer and more proven procedures for research and analysis (Eckhardt and Ermann, 1977). Thus at the broadest level there were two aspects of the survey task: An exploratory phase to discover experts' views about the nature of environmental problems; and, a

tighter confirmatory phase to analyse, to test hypothesis and to check for sources of systematic error.

Social survey research presents a design problem in which there are four key questions to be answered (Weisberg and Bowen, 1977; Warwick and Lininger, 1975):

- what is the information that is required?
- who is to be consulted?
- how are they to be consulted?
- how are the data or responses to be analysed and interpreted?

In practice, a final solution to these inter-related questions is arrived at iteratively. In the discussion that follows, of necessity they are taken one at a time. The unavoidable result is that there is some referring forward and back. In some cases elements of the solution are disclosed in one place and justified in another. Difficulties with disclosing how a solution was reached to the problem of survey design are reduced by taking the question above in a different order, beginning with the most straightforward.

4.31 WHO IS TO BE CONSULTED?

The question of WHO should be consulted in the social survey raised a number of research issues. The first was that the notion of 'expertness' would need to be clarified. How might one distinguish between the expert and the merely well-informed, and how much did the distinction matter? Was someone like a tramper to be regarded as an environmental expert? The second was that, given the breadth of issues involved in environmental education, the panel of environmental experts to be surveyed was potentially a large one - involving perhaps between 100 and 400 people. The third

issue was that members of the study population were largely invisible. There was no obvious place of work, occupational class, society or other institution around which all of New Zealand's environmental experts might congregate and be identified. The fourth research issue that would have to be addressed was the possibility that the shared characteristic of 'expertness' might itself result in biased judgements about certain aspects of the world, rather than well founded judgements. A person might be an expert, but still remain overwhelmingly a human being when it came to making judgements about controversial environmental issues. Each of these research problems is discussed below.

Definition of an environmental expert.

In environmental education, the word 'environment' has a broad meaning. It includes aspects of the physical, biological, socio-cultural resource, economic and aesthetic environments in the local, national and global frames. The research problem posed here required that a sample of people be consulted who had 'expert understanding' of each of these facets of the total environment. Locating a group with this breadth of expert understanding was potentially a challenging task. Two essential issues were to be resolved: What is an environmental expert? and, how does one go about to find them?

The literature suggests that exceptionally restrictive definitions of expert status are not essential in social survey situations (Sackman, 1975). Social survey of expert groups is a technique known as Delphi survey, to which I will return later. Several authors of Delphi studies (reviewed by Sackman, 1975) have compared the judgements returned by the 'truly expert' and the

'merely well-informed' and found no consistent difference between them. On these grounds, an 'environmental expert' was seen as anyone both knowledgeable about an aspect of the New Zealand environment and involved in environmental management (where 'management' included 'debate'). In other words, an 'expert' was anyone who had both theoretical and practical understanding. People involved in environmental management would be found in certain occupations (such as environmental planning) and in certain citizen groups (such as the Royal Forest and Bird Society). People knowledgeable about environmental matters would have received recognition for their involvement. 'Recognition' was considered to involve significant occupational positions held; membership of Government advisory bodies; key positions in citizen groups; publications; conference papers; or media attention.

Thus an 'environmental expert' was defined as someone who:

- was involved in environmental management (where 'management' included debate), either professionally, through a citizen group or as a concerned individual; and
- was recognised for their involvement. Recognition could involve position in a group or occupation, publications or public recognition.

Given that it is now possible to recognise an environmental expert if one was encountered, the next question involved organising the required number of encounters.

Locating a panel of environmental experts satisfying the definition above was a significant problem to do with sampling. The primary difficulty was the lack of any obvious single occupational group or other concentration of expertise which could be defined as 'the population to be sampled'. Some of New Zealand's environmental experts were visible through their writings on environmental matters or other activities in the public arena. Many more invisible experts were likely to exist - employees of local or national governmental organisations and universities, the many members of citizen environmental groups, and simply well-informed citizens. While I did not know who they were, it was likely that they did.

A novel survey technique called 'snowball sampling' has been used in situations where the population to be sampled is only partly visible (Eckhardt and Ermann, 1977). Snowball sampling involves inviting known members of the target population to name others like themselves. It has been used successfully to make contact with prostitutes (Bryan, 1965) and terrorists (Eckhardt and Ermann, 1977). While environmental experts do not necessarily share many characteristics with either of these professions, they do share the feature of being well known to each other. However, a sample drawn from a population by snowball sampling methods may not be mathematically random (Warwick and Lininger, 1975). Therefore, it raised the possibility of failing to identify one or more specific classes of expert person or expert opinion that should be represented in the study. This is known as sampling bias (Weisberg and Bowen, 1977). Eckhardt and Ermann (1977) point out that:

The probability that a snowball sample is representative cannot be established statistically. The inability to establish this probability does not imply that the sample is necessarily biased. However, its representativeness must be judged by

the logical reasonableness that the sample is representative of the population rather than through statistical technique.

It was decided, therefore, to use a survey design involving snowball sampling, and to pay close attention to both safeguarding and checking the 'logical reasonableness' of the proposition that the sample was representative of the group from which it was drawn.

In a survey, all sources of bias, including sampling bias, should be removed. If they cannot be removed, they should be controlled by other means to at least some minimal degree, or the data returned in the study will be largely worthless (Eckhardt and Ermann, 1977; Weisberg and Bowen, 1977). In the context of this research problem, it would have been possible theoretically to minimise sampling bias by conducting the study in two discrete stages - one to discover the population to be sampled, and one to survey a random sample of that population. The whole population satisfying the definition of an environmental expert in theory could have been listed by multi-round snowball sampling by mail. Post-outs to new names would continue until the number of new names returned each round became insignificant. However, both the cost and the time involved in such an exercise was judged to be both prohibitive and also largely unnecessary.

It was decided to minimise sampling bias by beginning the snowball sample with a rigidly-defined quota sample (Eckhardt and Ermann, 1977) drawn from the visible population. It seemed reasonable to assume that the 'snowball' portion of the sampling procedure would take place without significant bias. That is, those

environmental experts who were contacted and asked to nominate others like themselves, would do so without systematically failing to mention any single class or group of experts who should be identified. Therefore, providing the snowball phase was initiated by contact with a sample of the population that was itself without significant bias, a sample could be drawn from the total population of environmental experts, both visible and invisible, that would be largely without bias. Where random sampling methods cannot be used, it is possible to approach the characteristics of a random sample by defining and justifying a set of characteristics of the population as a whole (e.g. 40% female, 25% living in Wellington) and selecting without bias visible individuals to fill those quotas. From a sampling standpoint, therefore, the survey required a minimum of two rounds. The first round to involve respondents selected by quota sampling from those environmental experts who were identifiable. The second and any subsequent rounds to involve respondents nominated by people contacted in previous rounds.

Dealing with demographic bias.

In addition to a loss of representativeness during sampling, the decision to survey only experts raises the possibility of bias (Sackman, 1975) in the sense of deviation from 'pure expertness'. First, it is likely that an expert group, however they are selected, will prove to be largely well-educated, professional and of high socio-economic status. In our society, expertness pays. Their responses may carry a general and systematic socio-economic bias; a view of the world from their corner of society. Further potential for bias lies in the possibility that the issues and opinions addressed in the survey might be influenced to a significant degree by

other more general demographic features of respondents - their culture, age, sex, location, education, etc may over-rule their 'expertness'. Delphi studies do not normally consider the possibility of demographic features of respondents affecting judgements (Linstone and Turoff, 1975; Sackman, 1975). However, the topic of the classic delphi study is not one that is likely to invoke passionate responses. A conventional delphi survey involves questions to do with the future price of commodities. In the context of this study, however some checks for demographic bias seemed advisable.

Demographic influences on the responses from the expert group could be identified by correlation techniques if two conditions were met. First, demographic data on respondents would need to be collected and second, the panelists' responses to the questions about environmental problems would have to be in some way quantitative. In addition to describing the environmental problems that they saw as facing New Zealand, panelists would also have to be asked to make quantitative judgements about some attribute of the problems, such as their importance - or at least, to return judgements that could be converted to quantitative measures of importance.

4.32 HOW ARE PANELLISTS TO BE CONSULTED?

The broad features of a survey design that would satisfy the requirements of the research problem were now in place: A panel of environmental experts was to be surveyed in at least two rounds. The first round was to involve a quota sample of 'visible' environmental experts, perhaps one hundred in number, who would be asked to complete two tasks. The first task was to nominate the environmental problems that they saw facing New Zealand. The second task was to enlarge the sample

by identifying other environmental experts. The second round would involve the enlarged panel, who would be asked to rate the importance of the environmental problems identified in the first round. They would also be asked to return a demographic description of themselves which would be used in a check for bias. The quantitative dataset would then have several uses, including checks for validity, reliability and bias. Quantitative results could also be subjected to multivariate analysis, which might reveal an underlying structure, and hence reveal the presence of environmental paradigms behind the environmental judgements.

In principle, there are four ways in which panelists can be surveyed in a manner consistent with the above design. Those four methods are: Group discussion (Linstone and Turoff, 1975); individual interview; telephone interview (Eckhardt and Ermann, 1977); and, mail survey (Weisberg and Bowen, 1977). However, given that the first-round panel would number at least one hundred and the second-round panel perhaps several times that, mail survey was the only practical choice. The alternatives would be prohibitively expensive. Could all of the design requirements of the experiment be met through mail survey?

The literature suggests that mail survey suffers from two major disadvantages (Erdos, 1970; Hoinville et al., 1978). The first (Henerson et al., 1978) is that response rates can be low, and when they are, people who do not reply may hold views in common that differ from the views of those who do reply. Hence replies may not be fully representative of the target population. The second disadvantage is that there is no opportunity for the researcher and the respondent to question each other,

should either a question or a reply be unclear. The third disadvantage is that the first two disadvantages tend to limit what can be achieved through mail survey. In order to maintain a high response rate, mail surveys must be short, simple and interesting (Erdos, 1970). In order to avoid responses based on incorrect interpretations, the issues explored should be straight forward and the questions clear and precise (Babbie, 1973).

However, mail survey also has a number of features that provided advantages in the context of this research problem (Henerson et al., 1978):

- they provide anonymity. It was likely that sensitive issues would be involved and anonymous responses were more likely to be candid;
- they permit the respondent to take time and formulate a considered response;
- they can be administered in a uniform manner to a large group of people. There are no problems with variation in interviewing procedure; and,
- they allow the use of more thorough scaling methods than do interview techniques (McKennell, 1974). Questions to do with the use of scaling methods are taken up below.

Despite these advantages, it was possible that the research design outlined here could not be conducted in a valid manner by mail survey (nor in a cost-effective way by any other method). The issues to be traversed were necessarily complex and, as I will describe later, the second round instrument was nearly 50 pages in length! Nevertheless, there was no reasonable alternative to mail survey. Therefore, I decided to proceed on that basis,

and furthermore, to use a design that was not oversimplified to court high response rates. As a result, survey design would need to pay attention to detail. Careful attention would also have to be paid to ensuring that respondents understood what was being asked of them. Attention would also have to be given to ensuring that no sub-group of panelists produced a common-mode reply failure. As the results introduced later in this chapter will show, that is exactly what did happen.

4.33 WHAT INFORMATION IS REQUIRED?

The discussion to this point suggests that the survey would have to complete three kinds of information-collecting tasks - one primary, one secondary and several of a 'housekeeping' nature. The primary intention of the study was to discover a justifiable set of environmental problems around which to base a national programme in environmental education. The first task, therefore, was to collect and collate statements about perceived environmental problems. The secondary task was to examine a set of hypotheses to do with a possible environmental paradigm that was believed to underly, and to give rise to, judgements about environmental problems.

This would involve the collection of quantitative judgements about the importance of the problems identified in the first task. The several housekeeping tasks included the need to snowball the sample and to collect personal descriptions of panelists to determine the extent to which judgements were the product of demographic bias. Issues to do with the validity and reliability of the quantitative survey data would also have to be examined (see later).

I have already suggested that an environmental problem is

a value judgement, a statement of belief, or opinion. The collection and interpretation of statements of opinion is the territory of attitude measurement (Summers, 1970; Henerson et al., 1978). An opinion is that aspect of a persons attitude structure that is accessible to verbalisation (Thurston, 1928; Hoveland et al., 1953). Numerous techniques for the measurement of attitude exist, since attitude measurement has become an important research area in the field of social psychology (Shaw and Wright, 1967). However, the measurement of attitude structures remains a theoretically complex and methodologically demanding research area. The demands of reliable and valid attitude measurement have a considerable bearing of the kind of information required in this study and also on the way in which it is collected. Issues to do with the measurement of attitudes that affect the overall design of the study are introduced here. More specific matters to do with the methodology of scaling are introduced in the next section. A discussion of detailed theoretical issues is relegated to Appendix 4A.

The measurement of attitude.

As Robyn Dawes (1972) points out, attitudes are measured more easily than they are defined. The ideas developed here do not hinge upon a precise definition of attitude, but it is worth noting in passing that most definitions refer to the belief that attitudes represent readiness for particular actions:

- "a... state of readiness... which predisposes an individual to react in a characteristic way..." (Cantril, 1934);
- "an existing predisposition to respond... which... guides and directs the overt behaviour of

the individual" (Cardno, 1955).

The salient point here is that attitudes as predispositions towards action cannot be measured directly. They must be inferred from behaviours that are acceptable as bases for inferences (Summers, 1970). The primary basis of inference in the field of attitude measurement has been self-reported beliefs and feelings.

The overall structure of an experimental analysis of attitudes towards some object or situation is discussed by Aubrey McKennell (1974). His recommendations are summed up by Figure 4.1. McKennell suggests that a complete investigation involves repeated stepping from a plane of concept development or response analysis, to one involving experiment and observation, and back again. In particular, he emphasises that the first step into the experimental plane should be qualitative and should involve completely non-directive eliciting of responses from the subjects.

The emphasis on a preliminary qualitative pilot as a preliminary to attitude measurement might be paraphrased in the statement that if you want to know how people think it is necessary first of all to make arrangements to listen to what they have to say.

The second step (back into the analytic plane) involves the content analysis of those responses to provide a set of 'items' (i.e. statements) describing 'the content of the attitude universe under investigation' (i.e. describing all possible reactions to the subject). The items should be expressed in 'natural population language'. The next step back into the experimental plane involves what McKennell calls the scale development pilot. This is the beginning of the quantitative phase of attitude measurement, which is known as 'scaling'.

The purpose of the scale development pilot is the development and proving of methods by which numbers can be assigned to the attitudes under test. Once one or more reliable scaling methods are available the quantitative experimental phase continues with an extensive survey of the target population. Back in the analytic plane once again, the quantitative data is analysed, typically, McKennell suggests, by factor analysis to reveal any underlying structure or dimensional properties in the attitude universe under investigation. The scaling of attitude structures may continue with further investigation of individual dimensions within the attitude universe.

McKennell's recommendations sit well with the survey design evolved here and also firm it up. They suggest an open-ended, explicitly non-directive first round which is content analysed to yield items; and, a quantitative second round with one or more scaling methods proven in the context of the population and attitude under examination. The second round data is factor analysed to reveal any underlying structure, which if present would suggest the presence of a paradigm.

Measurability and the lack of it.

Before leaving the topic of the measurement of attitude, one further issue should be considered. It is the possibility that the quantitative second round of the survey might return data that was largely random and meaningless because the rating task was too difficult to complete in a consistent way. It can be argued that the breadth of concerns represented by a diverse set of problem statements may be so great that the individual items are incommensurable. How many native forests harvested equals one nuclear war? How many high-lead

CONCEPTUAL OR
ANALYTIC PLANE

OBSERVATIONAL
PLANE

1) Background notions are clarified about what is to be measured.

2) The 'qualitative pilot'. Extended, open-ended, non-directive, contact with respondents to determine 'the content' of the attitude universe under investigation.

3) Analysis of responses, typically by content analysis, to provide 'items' which fully describe the attitude universe.

4) The scale development pilot. Ways are found of converting into numbers the properties of the attitude universe.

5) Analysis of quantitative data, typically by factor analysis, to determine the dimensionality or concept structure of the attitude universe.

6) The scaling of individual dimensions.

FIGURE 4.1: Six key steps in the investigation of an attitude structure (McKennell, 1974).

children equals one lost species of native bird? My belief that they can be compared - or at least that it is worthwhile to attempt a comparison - rests on this justification. It is that the problem statements become comparable if they all share a common property that is recognisable by those asked to perform the comparison (Selin and Wolfgang, 1964).

For example, I may present to a panel the question: How much better than my canary is my car? The question becomes answerable if three conditions are met:

- I must define 'best'. For example, by prescribing that it means market value in an as-is-where-is condition;
- I must give raters a clear description of the current state of the items involved; and,
- raters must be chosen who have good understanding of the second-hand markets for cars and canaries.

I must be sure, however, that all raters are using the same bases to make their judgements. If some are used to thinking of the value of cars like mine as scrap metal, while others rate the value of my car as a going concern, then there will be two sets of answers - or two dimensions - within the responses. The discovery that there are two different bases on which my car can be valued may be as important a result as the valuation itself.

However, the problem of demonstrating measurability remains. It is necessary to build into a complex attitude assessment experiment such as this, some way of providing evidence that the numerical values obtained have meaning. A solution to this problem emerges in the

context of the following discussion on scaling.

Scaling.

Attitude is a psychological variable. I have already suggested that attitude survey breaks into the field of mental measurement, which is an area characterised by both theoretical and methodological complexity. The nature of measurement (in the general sense) is clear enough - it is the assigning of numbers to nominated properties of items or objects in order to make them amenable to mathematical description or analysis (Cohen and Nagel, 1934). However, the process of assigning numbers to mental variables, which is called scaling (Garner and Creelman, 1970), presents a number of problems.

The essential problem that confronts any research project that ventures into the arena of scaling is this (Sellin and Wolfgang, 1964): in the physical sciences the process of assigning numerical value to variables (such as weight) is straightforward. In any consistent system of measurement, an object may have only one weight. However, the development of procedures for psychological measurement has resulted in two systems of measurement, each defensible on its own theoretical grounds, and each tending to return different measures for the same variable. The first system of measurement stems from the pioneering work of Fechner (1860) in psychophysics, which was extended by Thurstone (1927) to attitude measurement. The widely-used Likert scale is a simplification of the first methodological approach. The second system derives from the work of Stevens (1959) and Galanter (1962) who respectively demonstrated that a second theoretical-methodological approach yields consistent results in psychophysics and in purely mental domains. Furthermore,

it has been shown (Galanter and Messick, 1961) that the two approaches to the scaling of psychological variables yield results that are related to each other in a more-or-less unique way. When values obtained under the two systems of measurement are plotted one against the other the result can be anything from a straight line ($y = kx$) through a family of curves of the form $y = kx^z$ (where $z < 1$) to a logarithmic relationship ($y = k \log_{10} x$).

Two principles emerge from this discussion. The first is that two scaling methods should be employed in a complex attitude measuring experiment such as this. One should be of the Thurstonian type, such as a category scale (a tick-a-box scale) and the other should be of the magnitude, or direct, scale type developed by Stevens. Under direct scaling methods, respondents develop their own scales by using numbers to represent their response to each item. The second design principle is that the emergence of a relationship of the kind described in the previous paragraph between the results of the two scaling methods, is evidence that a psychological variable exists and is being measured in a consistent way. In other words, it indicates validity.

In its general sense, the term 'scaling' involves the assigning of numbers to objects (Coombes et al., 1970). In attitude measurement, scaling refers to the devising of scales of measurement for the representation of psychological variables (Garner and Creelman, 1970). The complexities of scaling have been a major focus of interest for those interested in attitude research and many texts on the subject of the measurement of attitude structures deal with little else. A number of theoretical issues to do with the selection, use and validation of scaling methods are relevant to this study.

However, in order to avoid breaking the development of the present section, the discussion of scaling has been relegated to Appendix 4A and only the essential design points are dealt with here.

This discussion of the survey design aspects of the research problem has been long. I have felt an obligation to disclose my thinking about the way in which the structure of the experiment was determined. The final design was complex. It was also risky in the sense that it pushed more than one of its methodological parts to their limits - mail survey and scaling, in particular. However, to reveal the results momentarily, the design held together and produced valuable results, although it was a near thing. However, while I have seen a need to describe the development of the overall design in some detail, there is less need to set down at the same level of detail descriptions of specific methodologies. This is true particularly where I have used standard approaches. In the section that follows, therefore, specific methods for mail survey, content analysis, etc are presented in minimal outline.

4.4 SURVEY RESEARCH METHODS USED

Aspects of the survey to do with theory and overall design have been introduced in the previous section. The final research design involved the use of six specific methodologies. These were:

- the location of a quota sample of environmental experts;
- survey instrument development and mail survey;
- content analysis and item writing;
- snowball sampling;
- the proving of scaling methods;

- the analysis of quantitative responses, particularly scale construction and factor analysis; and,
- quality checking, including attention to validity, reliability and sources of bias.

Each of these methods requires some further discussion. Where the methods used are standard and unremarkable, the discussion has been reduced to an essential minimum. Each of the methods employed also generated a set of results. In order to avoid working through the list twice - once to describe methods and once to describe results - the details of each method and the results obtained are considered together. A discussion of the implications of the two major sets of results is then introduced in section 4.5.

4.41 ROUND ONE METHODS

The experimental design developed in the previous section called for a two-round social survey of an expert group. The survey was to be conducted by mail. Methodologically, the first round involved four parts:

- the selection of a quota sample;
- the development of survey instruments and mail survey methods;
- the collection of a snowball sample of environmental experts; and,
- content analysis of written responses.

Each of these is discussed below.

Definition of the quota sample.

Quota sampling methods are not respected by the doyens of sample survey. Few authors other than Eckhardt and Ermann (1977) make reference to their use. According to

these authors, quota sampling involves first defining the characteristics of the sample to be drawn, and then selecting individuals in an unbiased way until each quota is filled. In the present context, the primary objective of the first round survey was to undertake a systematic search for environmental problems as they are perceived by people who ought to have the greatest amount of discrimination. On this basis, the two key characteristics of the sample were considered to be, first, 'expertness' - as it has been defined already - in some relevant dimension of the total environment, and second, geographic location. Geography was considered to be a significant characteristic because of the possibility that particular environmental issues may be regional in extent.

Within this basic formula the sample to be drawn was further defined so as to provide the basis for a systematic search. The structure of the sample to be drawn was represented on a 8 x 9 grid (Figure 4.1). Nine aspects of the total environment were defined and represented across the top of the grid. Eight geographic regions were placed down the side. The sample was further structured by requiring that, in total, it be 50% female and 22% Polynesian (including Maori). The proportion of Polynesian panelists was set at twice their representation in the New Zealand population because it was considered likely that the response rate from this group would be lower. Overall, two hundred replies were considered adequate and a reply rate of 75% was considered likely. Therefore, around 270 panelists were sought. In order to provide some flexibility, row and column totals were allowed to take values between 20 and 40.

ROW TOTALS	urban environment	Aesthetic/economic environment	Futures, scale of society	Planning for land and water use	Maori/polynesian perceptions	Social system	Physical environment-mental quality	Resource Management and conservation	Biological conservation	
Auckland city and North Auckland	1	6	5	7	8	2	3	3	5	40
Hamilton and Waikato	5	4	3	3	5	6	2	3	4	35
West coast, North Island	5	2	-	3	3	4	6	2	2	27
Central North Island	6	2	2	2	4	5	1	4	2	28
Wellington city and province	5	5	6	4	4	6	4	6	8	48
Nelson/West coast South Island	3	1	-	2	-	4	1	1	4	16
Christchurch city and Canterbury	2	6	3	6	3	5	4	4	7	40
Dunedin and Otago/Southland	3	4	1	5	-	5	2	3	4	27
COLUMN TOTALS	30	30	20	32	27	37	23	26	36	261

TABLE 4.1: The quota sample of environmental experts.

The task of locating names to complete the quota sample design was allocated to research assistants. This was done to avoid any bias due to my own knowledge of people in the running for the privilege of being in the sample. The following sources were consulted in the search for first-round respondents:

- current and past membership lists for the Environmental Council, the Social Sciences Council and the Planning Council;
- lists of participants at a number of recent workshops and seminars (e.g. Land Use Advisory Council seminar on Rural Depopulation; Commission for the Environment Workshop on Biological Resources; Unesco Workshop on Social Indicators);
- all major metropolitan daily newspapers for the previous two years were searched for reported statements made by New Zealand citizens;
- the Booklet, "An environmental directory - a listing of New Zealand groups and organisations" (Environmental Council, 1979);
- the Booklet, "New Zealand Associations, Societies and Clubs: a national directory", (Ellis, 1979);
- the periodical, "Soil and water", National Water and Soil Conservation Organisation and the Ministry of Works and Development. Searched for the period 1977 to 1980.
- nominations made by staff at the University of Canterbury in the Departments of Geography, Zoology and the Joint Centre for Environmental Sciences;
- lists of recommended people were contributed by:
 - the Commission for the Future (resources, social issues, futures);

- the Commission for the Environment (biological and physical environment);
- the Department of Internal Affairs (social environment);
- Mr Colin Percy of the Arney Road Teachers' Centre (a list of leaders of Maori and Polynesian groups in the Auckland region).

Once the selection process began it became evident that 'environmental experts' were distributed through the New Zealand population in a manner different from that assumed by the quota sample. There were two difficulties. The first was that members of government departments (DSIR, Lands and Survey, Forest Service) were dominating the panel. The second problem was that the proportion of women identified for inclusion was around 25% - about one half of the required representation. To overcome these problems the panel was further defined. Staff members of government departments and local bodies were limited to one third of the sample, as were university staff. The remaining one third was to be made up of citizens and members of citizen groups. To increase the representation of women, some men were balloted out and replacements sought. The process of locating suitable women panelists and balloting out men continued until the panel contained 37% women.

Despite these changes, the selection formula proved difficult to put into effect, for two reasons. First, because of the very high concentration of national level decision-making and opinion-making power that exists in the greater-Wellington area, the quota of Wellington panelists was complete before one quarter of the total list was full. Conversely, it proved impossible to complete the quota of panelists from West Coast, South Island. Second, because of what appears to be a New

Zealand-wide lack of expertise on social issues, expert social commentators were difficult to find. Eventually, the first panel was declared complete with 261 names; rather too many in Wellington, rather too few in the South Island and a little light on social commentators. All other design criteria were met.

Survey instrument development and mail survey methods.

Both instrument development and mail survey methods are well covered by the literature and need not be discussed in detail here. The major sources consulted with respect to instrument development were, Backstrom and Hursh (1963); Babbie (1973); Weisberg and Bowen (1977); and, Hoinville et al., (1978). Techniques of mail survey were based upon Erdos (1970). All survey instruments are shown in Appendix 4.B.

Content analysis.

The term 'content analysis' refers to a variety of techniques based around objective, systematic categorisation of communications (Gerbner et al., 1969; Holsti, 1969; Krippendorff, 1980). Content analysis is capable of being applied at a range of levels of sophistication, from simple categorisation of key words through to studies of the underlying tone, imagery or associations within communications.

In the context of the present study, little sophistication was required in the content analysis methodology. Round one panelists were asked to nominate the environmental problems that they saw facing New Zealand. Each response was expected to take the form of a subject or matter about which concern was felt, together with an assertion about that subject which would express the felt concern. The subject of concern would

be part of the environment. To take a simple example, a respondent might offer the statement that continued logging was destroying valuable native forests. In this problem statement the environmental subject of concern is native forests (not logging) and the concern is that of its destruction by logging. Content analysis was therefore employed as a simple categorisation exercise in which each nominated problem was recorded on a separate filing card, as a subject and an assertion about that subject.

The round one survey instrumentation and the particular approach in content analysis described above were tested in a pilot study. Thirty graduate students and staff at the University of Canterbury completed trial versions of the survey instruments during May 1980. Their responses were analysed without difficulty. Each respondent was interviewed after completing the survey to determine whether the wording had made clear what their task was, and whether the results of the content analysis represented correctly what they had intended to say. No changes were required to the instrumentation. However, replies were slow to arrive and the interviews confirmed that respondents found the task of setting down statements describing individual environmental problems to be difficult. Many were concerned about 'the environment'. Few were able to articulate clear and specific reasons for that concern.

The round one survey was posted to the 261 chosen panelists during June, 1980.

4.42 ROUND ONE RESULTS

Round one returned 184 useable responses. This represented a 71% reply rate, which was a little lower than had been designed for. Once again, there was evidence that respondents found the task of nominating specific subjects of their environmental concern a difficult one to complete. Replies were slow to arrive, and a number of respondents elected to write a letter endorsing the survey, or the concept of environmental education, instead of completing the survey instrument.

Two related difficulties emerged from the round one replies. The first was the traditional problem of mail survey, namely that panelists who do not respond tend to be the same kind of person. In this case, it was that section of the panel who were selected for their involvement in Maori/Polynesian affairs that largely failed to reply. The second difficulty involved a more general weakness in the area of social issues. With the exception of the problem of unemployment, responses did not contain repeated, specific references to social problems to the degree that this occurred for other classes or problems. In particular, the whole area of cross-cultural problems was conspicuously weak. Polynesian panelists did not reply and other respondents did not identify social and cross-cultural issues. This was the second time during the development of this study that social issues were found to be difficult to identify through the approach developed here.

I was reluctant to develop the study further with a general weakness in the social dimension, and a particular weakness in the area of Maori/Polynesian problems. Therefore, a further group of 20 expert social

commentators were chosen in a similar way to the selection of first round panelists. This group, half of whom had expertise in cross-cultural problems, were then interviewed either in person, or by telephone, using the round one instrument as an interview schedule. Five out of the nine specifically social issues carried into round two emerged from the personal interviews.

The 184 written responses to the first round survey, together with the personal interviews with social experts, produced just over 900 statements referring to environmental concerns. These responses were then content analysed.

Results of content analysis.

The approach to content analysis described in Section 4.41 above made possible the analysis of all but about 4% of the environmental problems nominated by round one panelists. As a further example of the way in which responses were categorised, consider this response:

ISSUE

"Development and progress should recognise the indigenous culture of this country as a positive contribution to the future direction of this country".

OPTIONAL COMMENT

"The ethnic minorities have so much to offer towards the quality of life in countries if allowed".

This reply was recorded on a card as:

Subject Maori culture (indigenous culture)

Assertion (capable of making) positive contribution to
future (social?) direction of this
country

The subject of the environmental problem to which the panelist was referring was considered to be Maori culture, not "development and progress".

Following categorisation, the cards were broken down into broad groups and then into sub-groups in order to identify the most frequently mentioned themes. No group of cards was considered to represent a significant body of opinion unless it contained at least 10 cards. Where groups of less than 10 existed they were united with the most similar group and the breadth of the problem widened. Each theme identified in this way was then written as a summary statement of 100 words or less, using the language and tone of respondents. Where respondents cited statistics to back their assertions (as they often did in connection with assertions about hydro-electric developments) mean values were included in the summary statement. Where they were angry, the tone of the summary statement was angry. Forty six such statements were the result of this analysis. All but two of the analysable problems nominated by round one respondents were represented by 46 summary statements.

The 46 summary statements that emerged from content analysis are presented in Appendix 4C. Throughout the remainder of this report it will be necessary to discuss one or more of these environmental problem statements. Whenever this is done I will refer to each issue by means of a label consisting of a number, indicating its order in Appendix 4C and its computer code, which has a mnemonic quality. Thus problem statement number five, which deals with depletion of global fossil fuel stocks, will be referred to as 5 MTWELLS. For convenience, the labels (number plus computer code), together with a short precis of each issue statement, are provided on a fold-

out flap at the back of this chapter. The implications of the set of problem statements is discussed in Section 4.5.

Results of snowball sampling.

In addition to asking panelists to record environmental issues, round one of the survey experiment also invited them to nominate other informed people who would be "...asked to react to each of the proposed issues". As a panel those who replied to round one made more than 850 nominations. However, because they showed a marked tendency to nominate each other, the number of new names was lower than that figure. In total 460 names were available for the second round of the study. The fact that the first round respondents nominated each other more frequently than they nominated others suggests that there is a reasonably cohesive social group of environmental experts in New Zealand, and that the quota sample penetrated that population.

4.43 ROUND TWO METHODS

In contrast to the first survey round, the second round was intended to return high level (i.e. interval or ratio level) quantitative data. Panelists were to be asked to rate the importance of the 46 environmental problem statements produced in the analysis of first round results. Their numerical responses were to be subjected to statistical analyses, including factor analysis. Data was to be examined by factor analysis in order to explore the hypothesis that there is an underlying environmental paradigm that gives rise to the qualitative and quantitative judgements identified in this study. Once again, the survey was to be conducted by mail. In terms of experimental methods used, the second round of the

survey experiment involved the following four parts:

- scaling methods development pilot study;
- the development of survey instruments for the collection of quantitative data;
- the collection and analysis of demographic descriptions of respondents; and,
- the factor analysis of survey data.

Each of these is discussed below. Once again this discussion is confined to an essential minimum.

The scaling methods development pilot study.

Because of the complexities involved in the scaling of attitude structures, a reasonably extensive scale development pilot was undertaken. A discussion of theoretical aspects of scaling has been introduced already, in Section 4.33. It identifies the key difficulty facing the scaling of attitude structures - the fact that there are two different theoretical/methodological approaches which can return different answers. However, those different answers, when plotted against each other, show a relationship of a particular kind (Figure 4.2). The emergence of a relationship of this kind, therefore, is evidence that the measurement phase is working. It implies, first that respondents understand what they are being asked to judge (so that their numerical responses are more than random numbers) and second that the scaling methods used are measuring consistently (in the sense of allocating numbers to 'things'). I have therefore sought a relationship of this kind as evidence that a consistent attitude structure was being evaluated in a valid way.

On the basis of the argument above, the scale development pilot was directed to the identification of two scaling

methods that would return data showing the relationship in Figure 4.2. Content analysis of first round responses had yielded 46 statements describing the environmental and resource problems identified by the panel. These statements were put before a panel of 150 high school teachers at a residential conference, who were asked to rate the importance of each problem to the next generation of New Zealanders. Three scaling methods were employed so that there were three relationships to be inspected. The three scaling methods were:

1. A magnitude scale (Stevens, 1968). Respondents were invited to use a number to represent the importance to the next generation of the problem statements. Responses were standardised to a common scale length (z-scores) (Sellin and Wolfgang, 1964).
2. A category scale (Thurstone and Chave, 1929). Nine numbered boxes were offered. The low end was labelled 'least important' and the high end, 'most important'.
3. A rating scale (Valins, 1966). Respondents were invited to give each problem statement a score out of 100 for importance to the next generation.

The use of each of these scaling methods is further discussed by Sellin and Wolfgang (1964).

The scale development pilot study produced a set of results that are notable for their consistency. The relationship between category scale data and magnitude scale data is curvilinear (Figure 4.3) and close to logarithmic (Figure 4.4). This result is consistent with those presented by Galanter and Messick (1961) and Sellin and Wolfgang (1964). The relationship between rating

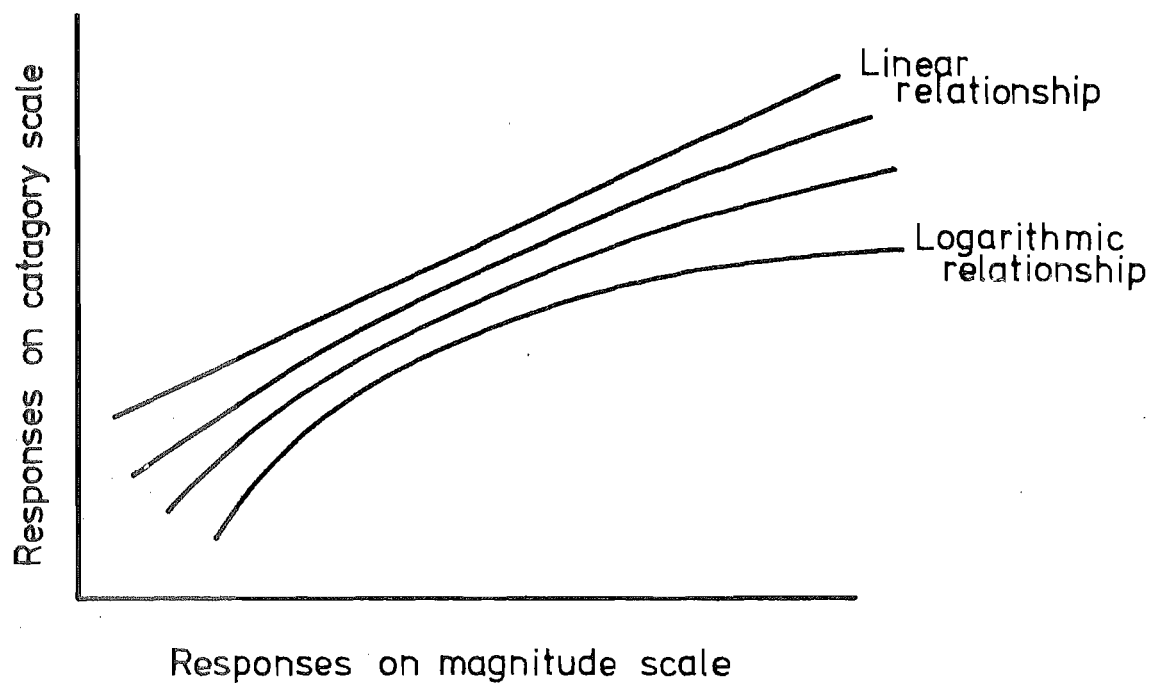


FIGURE 4.2: The general forms of the relationships between category and magnitude methods of scaling. (Galanter and Messick, 1961; Sellin and Wolfgang, 1964).

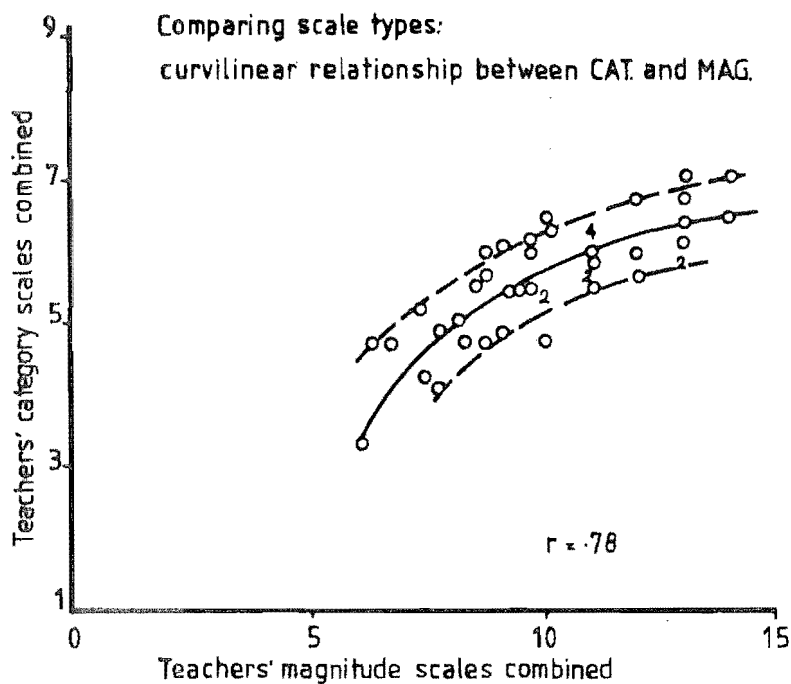


FIGURE 4.3: The relationship between category and magnitude scaling data in the scale development pilot.

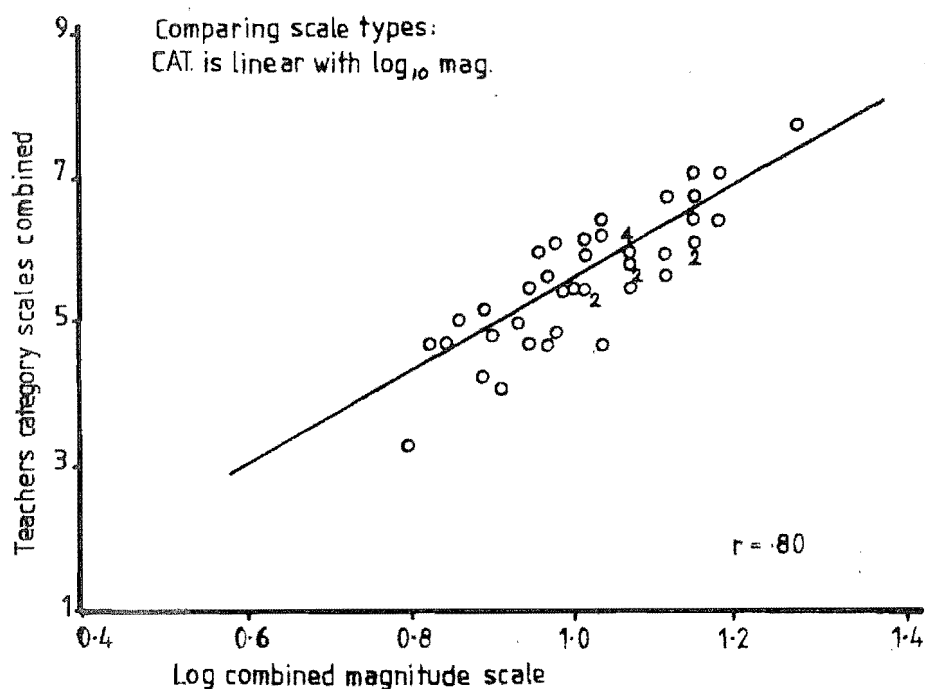


FIGURE 4.4: The relationship between category scale data and the logarithm of magnitude scale data appears linear.

scale data and magnitude scale data is also curvilinear (Figure 4.5) and close to logarithmic (Figure 4.6). This result is consistent with Robyn Dawes' view that what I have called a rating scale is a variant of a category scale (Dawes, 1972). Also consistent with that view is the finding that the relationship between category scale and rating scale data is linear (Figure 4.7).

On the basis of the results presented here, the second round of the survey could have proceeded using the magnitude scale type together with either the category or rating scale. The category scale was chosen because it is least like the magnitude scale, thus providing the strongest contrast between scale types. However, because of its greater power where 'strong statistics' are to be used (see Sellin and Wolfgang, 1964) a magnitude scale was sent to two thirds of the second round panel. The remainder received a category scale.

The development of survey instruments for the second round.

The survey design outlined earlier called for a second round in which problem statements were presented to the panel for rating on two different rating scales. In addition to a rating scale, the second round of the study was also required to collect basic demographic descriptions of the panel. The format of the instruments developed for this study closely followed those used by Sellin and Wolfgang (1964) in their analysis of the judged seriousness of crimes. The reader is referred to Sellin and Wolfgang's methodologically excellent study for further details of instrument design. Instrumentation for the second round is shown in Appendix 4B.

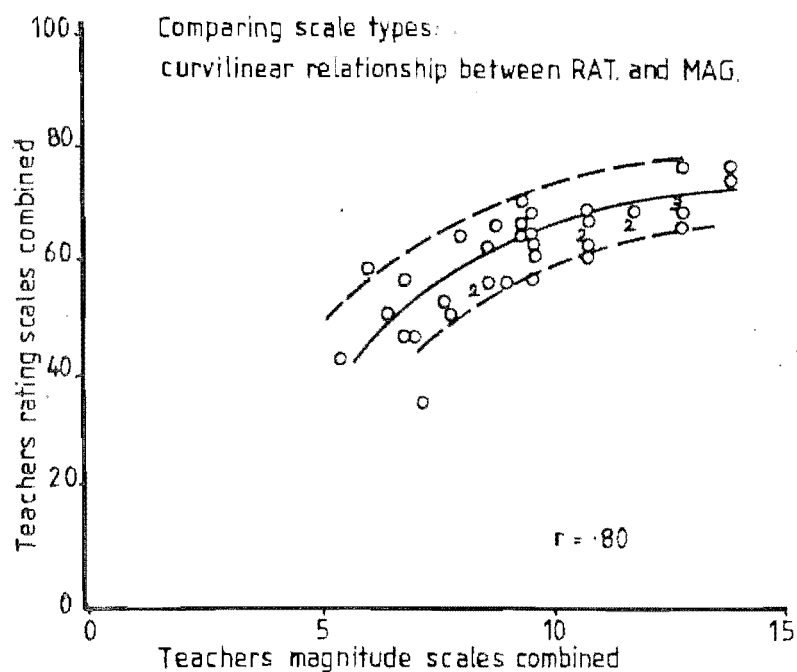


FIGURE 4.5: The relationship between rating scale and magnitude scale data in the scale development pilot.

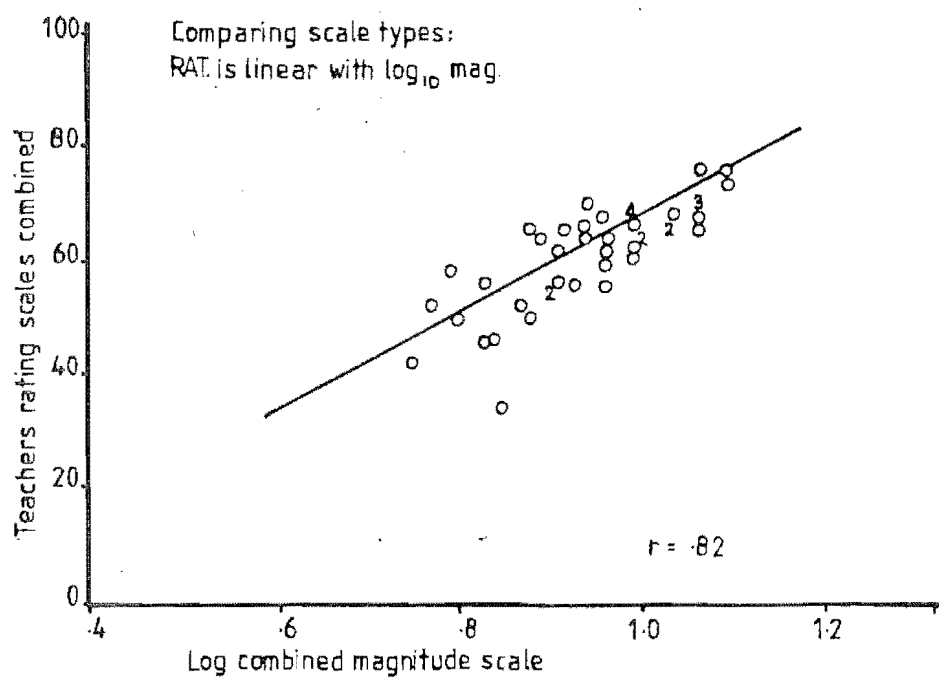


FIGURE 4.6: The relationship between rating scale data and the logarithm of magnitude scale data appears linear.

The first round of the survey had 'snowballed' the sample of environmental experts to a file of 460 names. The second round panel were assigned to rating tasks as follows: Because of the length and complexity of the second round instruments, a reply rate of 60% was considered likely. A minimum of 150 replies were sought; 50 on the category scale and 100 on the magnitude scale. At a reply rate of 60% these returns required that a minimum of 85 panelists be assigned to the category scale and 165 be assigned to the magnitude scale. Round two of the survey experiment could be conducted, therefore, with a minimum of 250 panelists.

Since 460 names were available, it was decided to introduce a second rating task. In the first (and still primary) task for the second round, a random selection of 250 panelists were assigned to the task of rating the national importance of the 46 problem statements. In the second task the remainder of the panel (210 people) were asked to rate the size of the contribution that education could make to solving each of the problems. However, panelists found the second task more difficult than the first. Replies suggested that they drifted into rating the significance of environmental problems rather than the set task. Because it returned inconsistent data, analysis of data from the second rating task is not continued with here.

The round two instrumentation was trialled on 45 postgraduate students at the University of Canterbury. Trialling included a 'trial' correlation between data collected on the two scales. A respectable correlation was obtained and no changes to the survey instrument were

found necessary.

4.44 ROUND TWO RESULTS

The second round of survey experiment elicited a considerable amount of interest. Response rates were high - 88% for the category scale format and 83%, for the magnitude scale (Table 4.2). A number of respondents requested additional copies of the survey booklet for their own use. Several unsolicited requests to take part were received from people who felt they had perceptions that should be considered.

However, not all of the second round responses were supportive. A small number of panelists - less than 10% - took strong exception to many of the problem statements. They either refused to rate them or made non-standard responses. One panelist who had been sent a magnitude scale instrument, rated all statements on a scale between 0 and -1,000,000. Thus there was evidence that a portion of the panel had values different to those that gave rise to the 46 problem statements. This in turn suggested that more than one dimension of attitude was being explored. While the survey was anonymous, a number of the dissenters signed their protest responses. Others could be identified through comments made. It was clear that dissent clustered around the discipline of economics.

All data returned on round two replies was assembled on a microcomputer. Magnitude scale responses were converted to standardised scores (Z-scores) in order to statistically stretch or compress the individual scales invented by respondents to a standard form with the same mean and standard deviation. For initial data manipulation, category scale responses were left in their

GROUP	ASSIGNED NO. OF PANELLISTS	JUDGING TASK	ANTICIPATED NO. OF REPLIES	ACTUAL NO. OF REPLIES	REPLY RATE %
1	85	National importance on CAT scale	50	75	88
2	165	National importance on MAG scale	100	137	83

TABLE 4.2: The organisation of panelists and the reply rates for second round tasks.

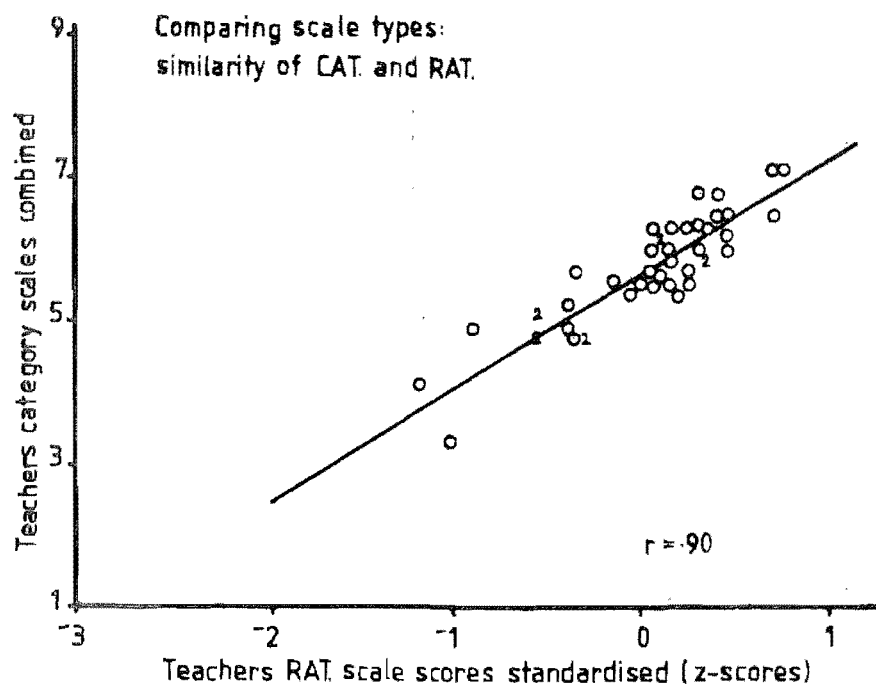


FIGURE 4.7: The relationship between category scale and rating scale appears linear.

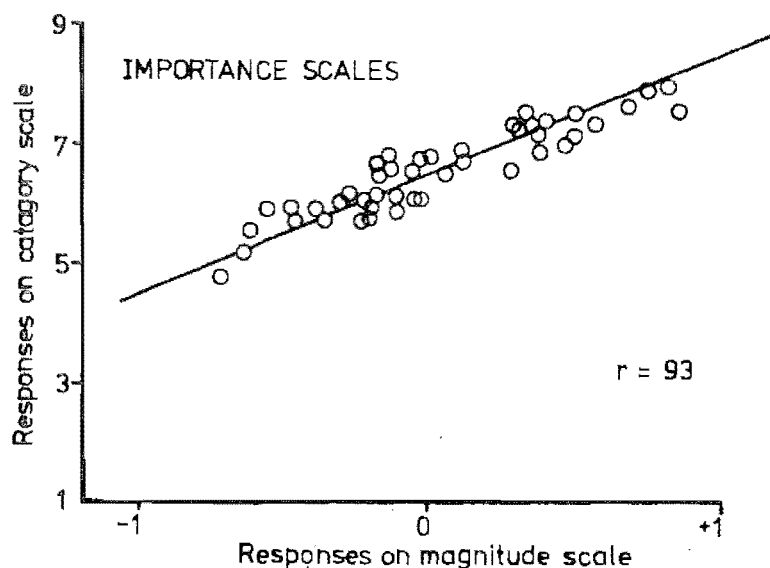


FIGURE 4.8: The relationship between category and processed magnitude scale responses for round two of the survey.

raw form. A summary of quantitative responses follows each of the 46 issue statements in Appendix 4C.

Figure 4.8 also shows a linear regression line of mean category score for each problem upon mean standardised magnitude score. As the line clearly shows, respondents using the category scale judged the national importance using only the boxes in the 'most important' end of the scale. In other words, they were reluctant to create the impression that any of the problem statements were unimportant. One significant consequence of this pattern of responses is that each respondent was able to contribute a limited amount of discrimination. Typically, respondents were assigning issues to only four or five classes of importance at the top end of the scale. Respondents using the magnitude scale, on the other hand, were inventing their own scale, quite unconstrained by a set number of boxes. As a result, they contributed more discrimination to the judging task. A correlation coefficient of .93 indicates that 86% of the variance in one data set is explained by the other. The remaining 14% of unexplained variance can be considered, therefore, to be a consequence of the greater discrimination within the magnitude scale data set. Most of the further development of the implications within the national importance data set was based upon the 'higher quality' magnitude scale data.

The impression gained at the end of the first round of a panel who perceive social problems only dimly deserves further comment. In general terms the second round panel handled social issues in a manner directly comparable to the first panel. The social costs of unemployment was the only social issue clearly articulated by first round respondents. In the second round 42 DOLECUE was rated

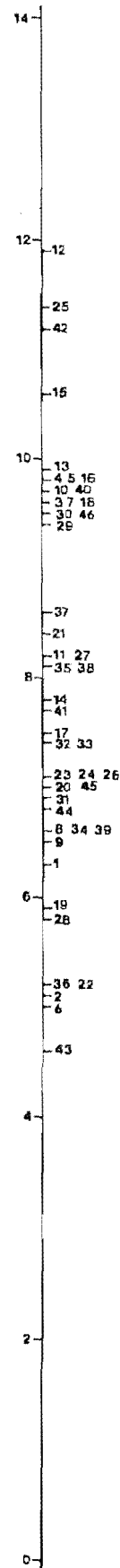


FIGURE 4.9:

One version of the scale of national importance which was constructed from geometric means of magnitude scale data. The numbers on the left represent a ratio level scale of national importance. The numbers on the right refer to the 46 issue statements.

near the top of the national importance scale (Figure 4.9). Cross-cultural problems were not perceived by first round respondents. The second round panel placed the three specifically Maori issues in the lower third of the scale. One of them, 43 TENAKOTU, was placed at the bottom. The statement 34 LOWMANA was judged to have about the same amount of national importance as 31 KEEPOUT. The failure by first round respondents to articulate cross cultural issues was paralleled, therefore, by the manner in which second round panelists awarded only limited importance to them.

The scale of national importance.

The principal reason for constructing a scale of national importance was to check the extent to which the 46 issue statements were all of genuine significance. In addition to this role, however, the national importance scale may have some intrinsic interest value in its own right, should the experimental data on which it is based prove to have validity. One version of the national importance scale is shown in Figure 4.9. It was constructed from geometric means of magnitude scale responses, and therefore is a ratio level scale (i.e. it has a natural zero point which means 'totally without national importance') (Sellin and Wolfgang, 1964). The highest-rated issue, 12 TRANSITN, was awarded a score of close to 12, and the lowest, 43 TENAKOTU, a score of just above 4. Thus the lowest rate issue was judged to have a national importance of around 40% of that of the highestrated issue. The value given to the lowest rated issue was high enough to suggest that all 46 issues had sufficient general importance to be retained in the developing study.

Demographic features of respondents.

The instrumentation for the second round of the survey experiment contained a short demographic questionnaire. Its intention was to provide a description of panelists so that their responses might be interpreted in the light of a better understanding of who they were. Demographic data also enabled the testing of the stability of numerical responses from different sections of the panel. Did their responses arise from 'expert understanding', or were they influenced to a marked degree by sociological characteristics such as age, education and sex?

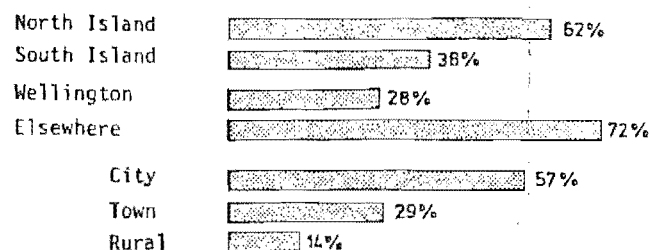
Demographic information collected during round two is presented in Figure 4.10. This information tends to confirm the possibility raised earlier that the group being addressed would cluster in some discrete socio-economic segment of society. Geographically, the panel was well distributed. Socio-economically, they were predominantly university educated, pakeha, professional and of mid-late career status.

The relationship between responses and demographic features of respondents.

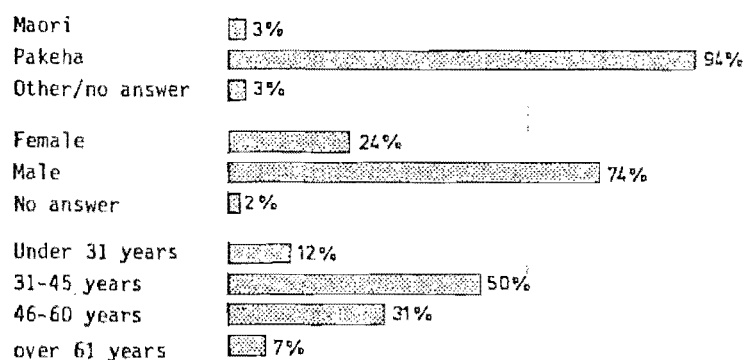
One important assumption underlying the use of any expert panel is that 'expert understanding' is the basis of responses. Individual demographic features of respondents - their age, sex, education, etc. are assumed to be minor influences upon judgements returned. Demographic information collected from respondents during round two enabled this assumption to be tested.

Testing for the presence of bias from individual demographic features of respondents took the form of a large number of simple statistical tests. Rather than using a single complex multivariate statistical procedure

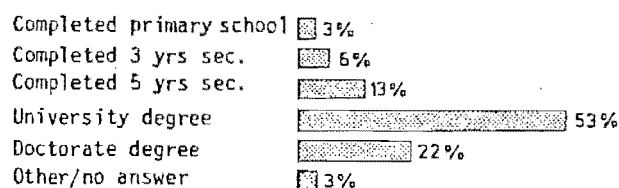
WHERE DO YOU LIVE?



ARE YOU:



YOUR EDUCATION



YOUR OCCUPATION

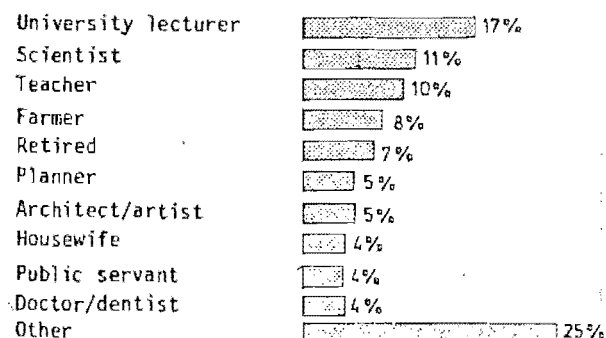


FIGURE 4.10: Basic demographic information on the second round panel.

- such as stepwise regression, principal components analysis or canonical correlation. The (parametric) magnitude scale data set obtained for each of the 46 issues was repeatedly divided into two on the basis of demographic descriptions of respondents, such as their age or sex. The two subsets of data were then compared using T tests. Three hundred and twenty-two T tests were completed in this way. The results obtained are presented in Table 4.3. Separate national importance scales were also reconstructed for each demographic subject of data to illustrate the movement of demographically-related issues. The two scales for female and male respondents are shown, as an example, in Figure 4.11.

Six demographic features of respondents were included in this analysis - education, age, sex, Wellington vs rest of N.Z., North Island vs South Island and Rural vs City. The seventh column in Table 4.3 involves responses to an attitude item that was included with the demographic questionnaire. Its significance will be taken up later. Six demographic features were explored in relation to each of the 46 issues - a total of 276 'cells' in Table 4.3. Of the 276 possible influences, 39 (or 14%) proved to be statistically significant.

As Table 4.3 shows, most of the 46 issues are largely free of influence by the demographic features tested here. A small number, such as 34 LOWMANA and 20 XSHYDRO, proved to be markedly contaminated by demographic bias. They are problem statements that the panel tended to respond to as humans, rather than as 'experts'. Overall, the basis on which panelists responded to the problem statements put before them was largely independent of demographic influence. This

ISSUE NUMBER	ISSUE CODE	DEMOGRAPHIC DESCRIPTORS						ATTITUDE ITEM AGREE cf. STRONGLY DISAGREE	NUMBER CHANGLS
		EDUCATION SCHOOL cf. UNIVERSITY	AGE OVER 45 cf. UNDER 45	SEX FEMALE cf. MALE	PLACE OF RESIDENCE				
					WELLINGTON cf. REST NZ.	N.ISLAND cf. S.ISLAND	RURAL cf. CITY		
1	CRAYGONE								0
2	WHALES				-23				1
3	NEWPHILO							-52	1
4	POPCRASH								0
5	MTWELLS					-36	+43		2
6	POSUM			-14					1
7	MONEY							-36	1
8	MALEDOM	-20	-25						2
9	PRETTY							+30	1
10	SELBLOOD								0
11	PLANCITY				+17			+27	2
12	TRANSITN								0
13	GLOBPOOR								0
14	BYEFARM						+40	+46	2
15	BIGBANG					+20			1
16	NONUKES			+35					1
17	FLOSION	+32	+41						2
18	BADMANGT			+31					1
19	TOSITOUT		+36						1
20	XSHYDRO	+43			-26		+34	-37	4
21	ALCON					-35			1
22	PBINGAS								0
23	DISEASE								0
24	YUM24ST								0
25	FREEINFO		-11						1
26	RECYCLE	+31							1
27	CLEANH2O	+32							1
28	UTROFIC	+40							1
29	LOWNZRES		+38						1
30	SAVEALL								0
31	KEEPOUT								0
32	RAPIDLOS								0
33	WETLANDS								0
34	LOWMANA		-23		+25	+20	-18	+34	5
35	C2H5OH							+58	1
36	COATUSE	+30							1
37	TROPTREE								0
38	SAVETREE		+32						1
39	LOSTSOC								0
40	EDUCATE					-29			1
41	NATPARKS								0
42	DOLECUE								1
43	TENAKOTU				+29	+10			2
44	POPSTRUC	+43							1
45	LANDFITE		-11		+18				2
46	NZPOOR		-20		+23		-33		3

TABLE 4.3: Statistically significant differences in the ratings given to variables by different sub-samples. Figures shows significant differences as a percentage of interval scale length.

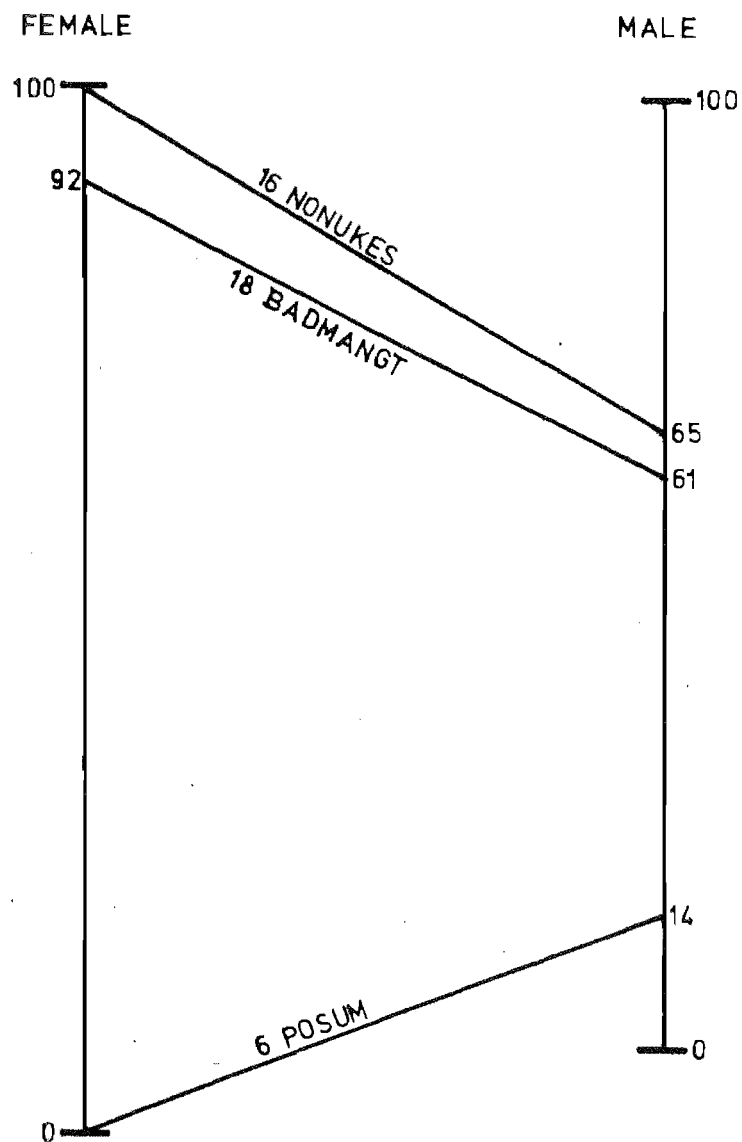


FIGURE 4.11: One of a series of comparative pairs of scales for sub-groups of respondents. This figure illustrates one of the columns in Table 4.3. The scales are interval level, with the distance between the lowest and highest rated issue on each scale divided into 100 units.

conclusion suggests that the results are worthy of further analysis. However, there are other matters to do with consistency that should also be considered.

4.45 CONSISTENCY OF RESULTS

Before the results of the two-round survey experiment are considered in detail, it is worthwhile examining evidence for the view that the results do have meaning. As I have already noted, attitude surveys are difficult enough, even when not conducted by mail. In general, if data from an attitude survey is to be held worthy of further analysis, it must be shown to have both validity and reliability. The psychometric concepts of reliability and validity are briefly reviewed in the following material. Evidence is then assembled which supports the conclusion that the study results possess both reliability and validity.

Reliability and validity.

Both reliability and validity require evidence of agreement between different attempts to measure the same psychological variable. According to Campbell and Fiske (1959):

Reliability is the agreement between two efforts to measure the same trait through maximally similar methods ... validity is represented in the agreement between two attempts to measure the same trait through maximally different methods..

When defined in this way, the concepts of reliability and validity can be regarded as the two ends of a continuum. It is possible to provide measures of consistency that fall part way along the continuum.

Construct validity is a particular class of validity that

refers to the degree to which the test measures some theoretical construct or attribute. According to Yeates (1977) a construct is, "... a theoretical idea developed to explain and organise some aspect of existing knowledge". Construct validity can be an accumulation of circumstantial evidence involving such matters as internal consistency within a given scale (Yeates, 1977) and correlations with other measures or descriptions of the same attitude structure or construct (which should be strong correlations) and with measures of other attitude structures (which should be weak correlations) (Neale and Liebert, 1980).

There are two basic types of reliability measures. Both are given as a numerical index. Both provide a correlation measure of the stability of the rank order of items (or individuals) that results from two attempts at measurement (Cronbach, 1970). Under the first kind of reliability measure the same test is applied at two points in time. This is called test-retest reliability. Under the second kind, which is known as split-half reliability, the results of one attempt at measurement are randomly split into halves and compared.

Evidence of consistency.

Aspects of the survey experiment that give evidence of either validity or reliability are as follows:

- there is a strong similarity between the construct represented by the domain of the 46 problem statements and the Belgrade Charter (Appendix 2A). In total, the problem statements represent a disaggregation of the domain of the Charter into a New Zealand perspective. This is evidence for the view that the problems this study is dealing with are the problems the Unesco/UNEP

programme is directed towards, hence construct validity;

- the panel behaved in a (perversely) consistent manner throughout in relation to social issues. Round one respondents failed to identify social issues in general, and cross-cultural issues in particular. When statements of social and cultural issues were obtained and inserted, round two panelists awarded them little importance. Cultural issues were dropped to the bottom of the scale of national importance. Internal consistency in behaviour, or construct validity;

- an examination of the scale of national importance suggests a high degree of internal consistency. Closely related issues usually have been awarded similar or identical scores. Pairs of related issues that received identical scores include:

- 23 DISEASE and 24 YUM245T;
- 3 NEWPHILO and 7 MONEY; and,
- 5 MTWELLS and 16 NONUKES.

Other examples can be found. Internal consistency within a scale indicates construct validity:

- other treatments of the data set produce similar scales. Scales were constructed from category scaling data, from combined magnitude and category data, from Z-score means of magnitude data, and from weighted magnitude data (round two respondents were invited to identify issues about which they had considerable knowledge. Their responses to these issues were then weighted). While other statistical treatments produced some shuffling of the order of issues, particularly in the crowded

middle part of the scale, all scales were, for practical purposes, very similar. Again, consistency indicates validity;

- the form of the relationship between two dissimilar attempts to measure national importance (Figure 4.8) conforms to that expected on theoretical grounds. The methodology is demonstrating consistency, which indicates validity;

- the data returned by the two dissimilar scaling methods showed a correlation of better than 0.9. In the context of this study it is uncertain whether the high correlation between the results of different scaling methods represents evidence of concurrent validity or for 'parallel forms' reliability. However, I have taken it to mean that respondents knew what they were judging - they had an accurate mental ruler with which to measure the national importance of the problems put before them; and,

- the judgements of national importance proved to be largely free of demographic influence. The hypothesis that 'expert understanding' would be the basis of responses has been confirmed with a small number of exceptions.

Overall, the evidence supports the conclusion that the two round survey returned data showing significant degrees of internal consistency and construct validity. It is worthy of further analysis.

4.46 FACTOR ANALYSIS OF SURVEY DATA

This chapter had three objective. The first was to develop a framework for a national environmental education strategy in the form of a set of environmental problem statements. The second was to distill out of the

framework a statement of 'that which was to be taught' in the name of environmental education in New Zealand schools. The third objective was to examine the origin of the environmental problem statements that are characteristic of environmental education.

I now wish to return to a further consideration of the proposed environmental paradigm underlying the experts' judgements about the environment. In the introduction to this chapter I hypothesised that there was a paradigm - a more or less consistent way of viewing the relationship between people and the environment - underlying and giving rise to perceived problems. If we were able to take it out and inspect it, that paradigm might provide a useful indication of the intentions of environmental education. It is possible that the dissemination of the 'paradigm of the environmentalist' is the one true, central objective of environmental education. If it exists, that is.

One objective of the survey study was to explore questions to do with the hypothetical paradigm that gives rise to the problem statements characteristic of environmental education. The intention was as follows: The second round of the survey experiment invited panelists to rate the national importance of each of the 46 environmental problems. If there were such a thing as a paradigm that was common to the thinking of a majority of the panel it would have imposed on the data returned by the panel as a whole an underlying structure. Factor analysis is a statistical method capable of revealing the nature of underlying determiners of this kind.

Factor analysis is one of a family of statistical procedures involving multivariate correlational analysis,

or CORAN (Cattell, 1978). Factor analysis is able to identify an underlying pattern of relationships in a set of variables such as the 46 environmental problem statements. The underlying pattern is expressed as a small number of constructs (in the sense of Yeates, 1977) that can explain, or even substitute for, the much larger number of variables. The constructs are known as common factors. Each of the constructs extracted from the data is built out of variance held in common by several of the variables in the set. The results of factor analysis take the form of a table showing the associations - positive, negative or neutral - between factors and variables. Interpretation of the table can provide insight into the framework of ideas that gave rise to it.

Factor analysis methodology.

Factor analysis is a parcel of related statistical techniques. All variants of the general method are both complex and demanding. All have the potential to lead on to both deeper understanding and to total nonsense, depending entirely on their use. Normally, one would not review the methodological literature to do with the use of a statistical technique. With factor analysis it appears necessary to support the selection and use of the various sub-methods with a general discussion of the principles involved. Because this methodological discussion is long, it has been relegated to Appendix 4D. A precis of the methodology is presented here.

Major features of the methodology are as follows:

- the methodology employed primarily follows the work of Cattell (1978), but also involves recommendations presented by Harman (1967); Guertin and Bailey (1970) and Kim (1978);

- features of the data set that indicated the presence of factor structure within it included an intercorrelation matrix containing 14% of values that were statistically significant at the 1% level, and the emergence of a classical scree test (Figure 4.12). The matrix was singular;
- the true number of factors sought was determined by application of both the Kaiser-Guttman rule (which indicated 17 factors) and a scree test (which indicated 6 factors). Initial extractions with both numbers indicated clearly that 6 was the correct number; and,
- all statistical procedures were performed using SPSS (Kim, 1978) subprogramme FACTOR. Factor extraction was performed using a statistically neutral procedure (principal axis - PA2); a variable-correlation maximising method (cannonical factoring - RAO); and, a case-correlation maximising method (alpha factoring - ALPHA). Both orthogonal and oblique rotations were performed. The resulting factor patterns were very robust and largely invariant under the diverse combinations of statistical procedures used. The six factors accounted for 32% of common variance of the 39 variables that formed part of the factor structure.

Results of factor analysis.

The hypothesis that an environmental paradigm was responsible for judgements about environmental problems is supported in a most elegant way by the results of the factor analysis. However, there is a surprise. The factor analysis reveals not one, but two constructs underlying the survey data. The two constructs sit in total, unequivocal opposition to each other.

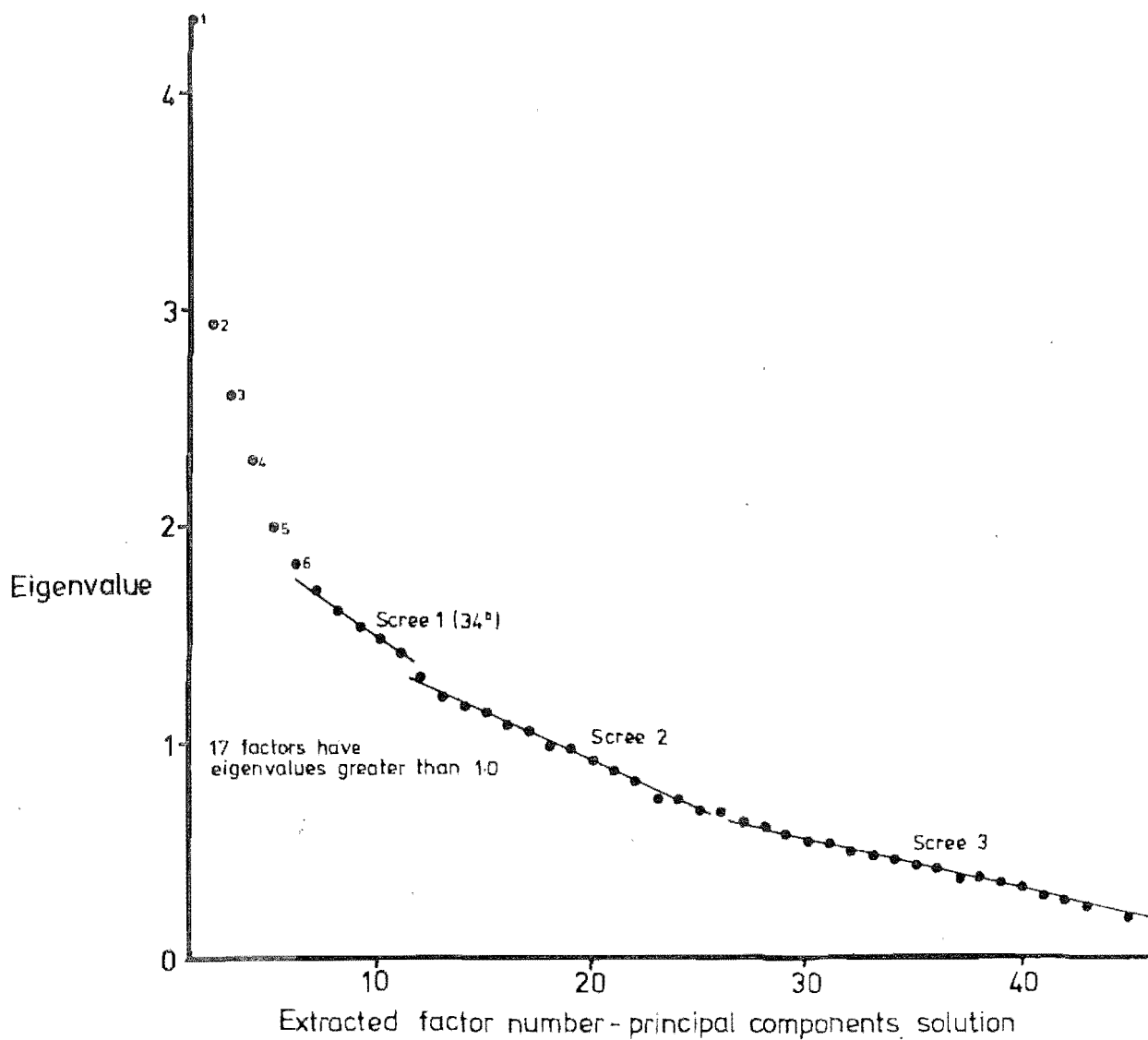


FIGURE 4.12: The scree test obtained during factor analysis was of a classic form (see Cattell, 1978). It indicated the presence of six true factors.

Factor analysis results in a table showing the 'loadings' of factors on variables, called the factor pattern matrix (Table 4.4). In the present case, the factors can be regarded as 'themes of concern' which unite several of the variables or problem statements. Loadings may be positive, zero or negative. A positive loading indicates that the issue contributes some meaning to the factor. A zero loading, which is here taken to include the range $+ 0.2$, means that the factor and the variable share no meaning. A negative loading means that the problem statement is in some way the same as the factor (because it loads) but different (because it loads negatively).

Table 4.4 shows the factor pattern matrices. Of the 46 issues put to second round respondents, only 39 contribute to the factor structure. The remaining 7 issues have meaning in their own right, but are not part of the 'themes of concern' identified by factor analysis. These 39 issues are arranged down the left-hand column. The six factors are labelled across the top. Each factor contains two columns, one for results from the principal axis - orthogonal treatment and the other for alpha-oblique. Note that the factor columns are shown out of order (1, 3, 2, 4, 5, 6) for reasons to do with emphasising the relationships between them. Factor numbers, in fact, have little meaning other than as convenient labels. The numbers in Table 4.4 are the loadings. All loadings between $-.20$ and $+.20$ are regarded as zero and have been left out for reasons of clarity. The order of the problem statements in the left-hand column has been reorganised so that they sit in their groupings. Most factors are bipolar (i.e. contain both positive and negative loadings) and several are interrelated in that they 'echo' groupings that appear in each other. There are ten quite distinct groups of

FACTOR NUMBER	1		3		2		4		5		6	
EXTRACTION ROTATION	PA 2 ORTHOG	ALPHA OBLIQUE	PA 2 ORTHOG	ALPHA OBLIQUE	PA 2 ORTHOG	ALPHA OBLIQUE	PA 2 ORTHOG	ALPHA OBLIQUE	PA 2 ORTHOG	ALPHA OBLIQUE	PA 2 ORTHOG	ALPHA OBLIQUE
ISSUES			Group 1									
30 SAVEALL			.55	.59								
38 SAVETREE			.53	.50								
41 NATPARKS			.51	.51								
33 WETLANDS			.48	.50								
2 WHALES			.46	.42								
32 RAPIDLOS			.40	.41	Group 4							
37 TROPTREE			.36	.34	-.38	.47						
15 BIGBANG					-.62	.56						
16 NONUKES	Group 2				-.51	.44			.22			
4 POPCRASH	.21	-.25			-.49	.52					-.33	
5 MTWELLS	.25	-.35	-.25	-.25	-.28							
12 TRANSITN		-.23	-.23	-.21		.23					-.23	
10 SELBLOOD	.21		-.21									
29 LOWNZRES	.48	-.42	-.33	-.31								
13 GLOBPOOR	-.34				-.39	.45					-.31	
46 NZPOOR	-.52	.53	-.34	-.44								
8 MALEDOM	-.52	.42	-.26	-.34		.28						
44 POPSTRUC	-.30	.49	-.23	-.36								
34 LOWMANA	-.60	.68		-.30					-.25			
21 ALCON	Group 3						Group 6				-.23	
20 XSHYDRO							-.64	.54				
8 BADMANGT							-.31	.32			-.21	
25 FREEINFO							-.54	.42				
36 COASTUSE			.26	.29	.23	Group 5		-.32	.23			
9 PRETTY					.34	-.41						-.27
28 UTROFIC			.23	.26	.26	-.26	.35	-.25		.24	.22	
11 CITY			-.31	-.32	.31	-.33			Group 7			
23 DISEASE			-.23	-.22					.61	.64		
24 YUM2-45T									.46	.48	Group 9	
22 PBINGAS								.22		.29	.47	.36
26 RECYCLE										.27	.38	.25
27 CLEANH2O					-.22		.33				.30	.21
19 TOSITOUT					-.26						.35	
3 NEWPHILO											-.43	-.47
40 EDUCATE											-.23	-.41
7 MONEY								.26	Group 8		-.25	-.48
39 LOSTSOC										-.28	-.23	-.23
45 LANDFITE									-.34	-.23	Group 10	
43 TENAKOTU									-.47	-.49		

TABLE 4.4: Factor pattern matrix. National issues are listed downward and factors across the top.

loadings, which have been outlined for emphasis. Overall, the factor structure is clear and distinct. It is also particularly complex, so that it demands careful interpretation.

Interpretation has been approached as follows: A factor may emerge from the rotation phase upside down. That means that the negative loadings are best read as positives, and vice versa. In other words, positive and negative loadings have no intrinsic significance other than to indicate complex 'same but different' associations. Interpretation is usually approached, therefore, by identifying first the groupings of variables and their essential shared meanings, before constructing final interpretations of the factors, most of which unite two or more groups of variables. In this case, a third level of interpretation has been constructed.

Here are the main groupings of issues:

GROUP 1 BIOLOGICAL SYSTEMS AND SPECIES ARE DISAPPEARING
 Strong group on factor three. Representative
 issues: conserving forests and whales,
 preserving national parks. Scale is national.

GROUP 2 WE ARE USING UP RESOURCES AND ENERGY TOO
 RAPIDLY
 Strong group for which the variance is divided
 between factors one and three. Representative
 issues: New Zealand's lack of energy and other
 resources, global depletion of energy, global
 increase in population, export of resources
 from N.Z. National and international in scope.

GROUP 3 NEW ZEALAND SOCIETY DISCRIMINATES AGAINST

CERTAIN GROUPS OF PEOPLE

Strong group on factor one, strong echo on factor three. Representative issues: the low social and/or economic status that is accessible to people who are not male, not skilled and not pakeha.

- GROUP 4 ON A GLOBAL SCALE THE ACHIEVEMENT OF MILITARY, POLITICAL AND ECONOMIC ENDS IS GIVEN PRECEDENCE OVER MEETING REAL HUMAN NEEDS

Strong group on fact two. Representative issues: nuclear weapons, global deforestation, global poverty, multinational corporations.

- GROUP 5 THE NEW ZEALAND ENVIRONMENT IS NO LONGER AS ENJOYABLE AND AESTHETICALLY PLEASING AS IT ONCE WAS

Moderate strength group on factor two. Representative issues: environmental aesthetics, the appearance of coastlines and waterways, city planning, access to tranquillity.

- GROUP 6 GOVERNMENT-INITIATED, LARGE SCALE RESOURCE DEVELOPMENTS ARE NOT UNDERSTOOD

Strong group on factor four. Representative issues: hydro-electric developments, dealings with multinationals, lack of access to information, aluminium smelting, energy schemes.

- GROUP 7 WE CAUSE CONTAMINATION OF PEOPLE AND THE ENVIRONMENT BY DELIBERATE USE OF TOXIC SUBSTANCES

Strong group on factor five. Representative issues: the use of lead in petrol, additives in food, agricultural and industrial chemicals.

GROUP 8 MAORI CULTURE (AND ALL THINGS UNIQUE TO NEW ZEALAND) SHOULD BE ACCORDED GREATER VALUE

A weak group on factor five. Representative issues: holding Maori culture in higher regard, having more regard for uniquely New Zealand things, establishing our own national identity.

GROUP 9 SIMPLE, PRACTICAL MEASURES SHOULD BE TAKEN TO CONSERVE OUR RESOURCES AND ENVIRONMENT FOR THE FUTURE

Moderate strength group on factor six. Representative issues: recycling, maintaining water quality, building for durability. National in scope.

GROUP 10 THE FUTURE WILL REQUIRE A NEW PHILOSOPHY AND VALUE SYSTEM

Moderate strength group on factor six. Representative issues: the need for a new philosophical basis for N.Z. society, environmental education, achieving social and environmental goals, less emphasis on economic goals.

Evidence for two environmental paradigms.

The ten groups of issues outlined above are distributed across six factors in a complex way. The manner in which the groups above are related on factors and 'echoed' between factors suggests the existence of a further level of meaning. The factor pattern is both robust and clean, which supports the view that there is further meaning to be found. However, the complexity of the overall factor structure obtained implies that an unequivocal interpretation of its deeper meaning would require additional survey and factoring to confirm tentative interpretations. Nevertheless, further interpretations

can be made, for which there is supporting evidence available.

When examining the factor structure as a whole, the overriding feature is the almost universal presence of bipolarity, which can mean conflict (Cattell, 1978). With the exception of factor four all other factors contain groups that exhibit complex relationships implying 'same topic but different views of the problem'. The conflict implicit in the factor pattern matrix is reminiscent of the sharply dissenting views recorded by a number of second round respondents. It seems possible that the factor structure represents not one, but two conflicting paradigms concerning problems to do with the relationship between people and the environment. This working hypothesis becomes increasingly apparent as the set of factors is interpreted.

Here are the factor interpretations:

FACTOR6 CONFLICTING APPROACHES TO A SUSTAINABLE FUTURE
 SOCIETY

Factor 6 unites variable groups 9 and 10 above. They hold in common the idea that achieving a sustainable future society in New Zealand will require changes to our present way of life to conserve both environment and resources. However, there is conflict between two views about how this should be done. Issue group 9 suggests that our present society is basically sound, but that attention needs to be given to a number of immediate and local issues. Resources should be used more frugally (19 TOSITOUT, 26 RECYCLE) and obvious sources of environmental contamination should be removed (22 PBINGAS, 27 CLEANH2O). There is an implication that existing social directions are basically sound. Issue

group 10 suggests that more radical change is necessary. A new underlying philosophy is needed (3 NEWPHILO) which places greater emphasis on the value of more fundamental social goals (39 LOSTSOC) and less on economic goals (7 MONEY). Environmental education is part of this 'new deal' (40 EDUCATE). Fundamental change is implied and the issue group carries a number of low loadings suggesting that it has a global setting. Note that respondents associate environmental education with radical reform rather than evolutionary change.

The difference in approaches to sustainability can be interpreted as a paradigm conflict. One view is satisfied with the existing direction of society, but proposes attention to immediate, local difficulties. The second sees these difficulties as mere symptoms of an underlying malaise of philosophy and belief. Fundamental reforms are proposed. The conflict has about it a 'local view' vs 'global view'.

FACTOR 2 CONFLICTING SCALES IN CONCERN FOR HUMAN WELFARE
Factor 2 unites issue groups 4 and 5 in a bipolar fashion. Superficially, there appears to be little in common between these themes. Group 4 is closely reminiscent of the United Nations proposals for a 'new international order'. It proposed a more equitable distribution of earth's resources (13 GLOBPOOR), dealing with fundamental threats to human welfare (15 BIGBANG, 37 TROPTREE). Set in opposition to these goals is issue group 5.

Group 5 unites issues that have in common themes of loss of aesthetic quality or enjoyment potential in the New Zealand environment (36 COASTUSE, 9 PRETTY, 28 UTROFIC, 11 CITY). Attention to aesthetics and the needs of New

Zealand citizens for recreation, enjoyment and tranquility is advocated.

Factor 2 appears to identify a fundamental dimension of the conflict between paradigms. One group of issues directs our attention to problems that are fundamental in nature, global in scope, and are borne mainly by other societies and other generations i.e. by those who are not of our culture. I will label this focus of concern 'not us'. The other group of issues addresses problems that are immediate, local and that affect 'us' - the members of our culture who are here, now. Thus factor 2 may be setting in opposition two groups of issues that are symptomatic of a key difference in the scale, or scope, of the paradigms. The 'us' paradigm proposes that our primary concern ought to be attached to immediate problems (as in factor 6) faced by 'us' (however trivial). The 'not us' paradigm believes that our attention should be devoted to the fundamental problems (as in factor 6) that affect the welfare of those who are 'not us' (however intractable).

FACTOR 1 CONFLICT OVER RESOURCE CONSERVATION AND DEVELOPMENT

Factor 1 identifies a second fundamental dimension of the conflict. It unites issue group 2 and 3. Group 3 deals with social and economic status and advancement in New Zealand society. Its theme is that there are people among us who have not yet achieved financial security (46 NZPOOR), or access to the mainstream of society (34 LOWMANA, 8 MALEDOM). Set against this theme of concern is issue group 2, which is essentially a resource conservation theme. It expresses concern for the consequences of the development of New Zealand's resource base (29 LOWNZRES, 10 SELBLOOD) against a background of a

global resource crisis (5 MTWELLS, 4 POPCRASH).

Given the interpretations of factors 6 and 2 above the implications of this opposition seem clear. The 'us' paradigm seeks to maximise the flow of social and economic benefit to 'us' - especially to those of 'us' who are presently disadvantaged. Resolution of their needs implies that available resources should be developed. All of 'us' should have access to the benefits of economic development. The 'not us' paradigm seeks to minimise disadvantage to people who are 'not us'. Resolution of their perceived needs requires that our use of resources is restrained. In interest of others, 'we' must bite the bullet.

Both groups of respondents are expressing a concern for the welfare of people. It is in the different frames held by the two groups (identified clearly in factor 2) that the conflict originates.

FACTOR 3 CONFLICT OVER BIOLOGICAL CONSERVATION AND ITS IMPLICATIONS

In the unrotated factor structure, factor 3 emerges as factor 1. This means that it carries the most general or pervasive theme in the whole data set. Its interpretation has been left to this point because the factors already interpreted contribute to its explanation.

Factor 3 is an extension of factor 1 above. It unites issue groups 2 and 3 (which were set in opposition in factor one above) against issue group 1, which carries all the biological conservation statements. The concern of one group of respondents for people who are 'not us' is extended to include other species. 'We' must restrain our use of biological systems because other species are

being disadvantaged. The conflicting view is that biological conservation hampers the mobilisation of resources for the benefit of people who are here, now, and the need to conserve non-biological resources.

The last two factors, 4 and 5, can be given meaning without applying the two-paradigm interpretation, although it does help.

FACTOR 4 GOVERNMENT INITIATED, LARGE SCALE RESOURCE DEVELOPMENTS ARE NOT UNDERSTOOD

Factor 4 is the only theme upon which both paradigms agree. Concern is expressed about the viability of government initiated (18 BADMANGT), resource developments (21 ALCON) about which little is understood (25 FREEINFO). Evidently, these developments do not appear to respondents to meet the requirements of those who would mobilise resources for the benefit of those who are here now, nor those who would conserve resources for the benefit of other generations.

FACTOR 5 OPENNESS TO GOOD AND BAD INFLUENCES

Contamination - or influence - is clearly the unifying theme in factor 5, but there is a distinctly complicating twist. Factor 5 sets in opposition issue groups 7 and 8. All issues dealing with pollution or contamination fall into group 7. The emphasis - the highest loadings - fall on issues that express concern for the consequences for human health of the widespread use of chemicals in agriculture and industry (25 YUM245T, 23 DISEASE). Pollution of land (26 RECYCLE), water (27 CLEANH2O) and air (22 PBINGAS) are less significant. Note that the emphasis here is not upon pollution - a traditional environmental education topic - but upon deliberate use of substances that have unwanted 'influences'.

The weak group 8 issues are set against these. The essential theme of group 8 is that New Zealand culture and values should be 'influenced' by including more that is Maori, more that is indigenous. The factor structure appears to be suggesting that this is 'cultural influence' (because group 8 appears on factor 5), but that these are 'wanted influences' as opposed to the group 7 issues, which are 'unwanted influences'.

Elements of the conflict between the 'us' paradigm and the 'not us' paradigm are still apparent. The 'us' paradigm continues resolutely to seek maximisation of social benefits to 'us' by admitting more 'influence' from outside the mainstream of our present culture. The 'not us' paradigm continues just as resolutely to seek minimisation of the unwanted 'influences' of our present reliance on technology.

Points of difference between the two paradigms are summed up in Table 4.5.

Supporting evidence for the two-paradigm interpretation. The factor structure revealed here is complex. The two-paradigm interpretation presented above should be regarded as tentative and requiring further confirmation. Good confirmation would require further attitude survey and analysis. It is not my intention to proceed with that task here. However, there is some evidence, from both within and beyond the study, that lends support to the interpretation given here. There are three sources of support: First, the two-paradigm interpretation is consistent with the way in which social issues have emerged throughout the study; second, a single attitude item (column 7 in Table 4.3) produced responses that

	THE 'US' PARADIGM	THE 'NOT US' PARADIGM
FOCUS OF CONCERN	'Us' our culture The people who are here, now (especially if disadvantaged)	'Not us' other cultures other societies, other generations, other species (especially if disadvantaged)
PRIMARY GOAL	Ensure that legitimate opportunities for benefit are available to people	Prevent costs of our actions, lifestyles falling upon others.
RIGHTS vs RESPONSIBILITIES	All of 'us' have rights to take part in social and economic betterment.	We hold collective responsibility to make sacrifices for the benefit of those who are 'not us'.
PRESENT SOCIETY	Basically sound. Some limited review necessary.	Requires fundamental reform.
TECHNOLOGY	Satisfies legitimate human needs.	Is the source of many problems.
TYPE DISCIPLINE	economics	ecology
PHILOSOPHICAL GROUNDING	Nozick	Rawls
CONCEPT OF ENVIRONMENTAL PROBLEMS	Problems are <u>barriers</u> which prevent some of 'us' achieving socio-cultural and economic goals.	Problems are <u>consequences</u> for those who are 'not us' of actions undertaken by 'us'.

TABLE 4.5: A summary of the key points of difference between the two environmental paradigms.

support the interpretation; and, third, both paradigms appear to be reflections in the environmental sphere of the two fundamental and opposed positions in modern moral philosophy - the individual rights philosophy of Robert Nozick (1974, 1981) and the collective responsibility advocated by John Rawls (1972).

The first source of support for the two paradigm interpretation involves the way in which panelists dealt with social issues. Throughout the study social environmental problems have been either ignored or down-rated by respondents. This behaviour is consistent with the fact that the panel appears to have been composed largely of 'not us' paradigm-holders. Under the interpretation given above they could be expected to place the interests of all members of their culture, including the downtrodden, below the interests of disadvantaged others, everywhere. The problems of those who are 'not us' are seen as very much more worthy of our concern.

A small space on the last page of the round two survey instrument provided an opportunity to include a single attitude item. This Likert-type item invited panelists to respond to the proposition that, "...whenever there is a conflict between conservation and development, we should choose development". Serendipitiously, this item went to the heart of the conflict between the two paradigms. Responses to the 46 problem statements returned by those who 'agree' with the item were compared with those who 'strongly disagree', in the same manner as for demographic differences. The results are shown in the last column of Table 4.3. Note, however, that a single attitude item represents only fragile identification of those who favour development over

conservation. Those who favour development were considerably more concerned about problems facing 'our' people (35 C2H5OH - top of their scale of national importance; 34 LOWMANA); more concerned about immediate focus issues as in factor two (9 PRETTY, 11 PLANCITY); and considerably less concerned about failures of our current socio-political system (3 NEWPHILO, 7 MONEY). All of these findings are consistent with the interpretations made above.

Finally, the two paradigms identified through factor analysis of survey data derive support from their similarity to the philosophies of Nozick and Rawls. The conflict of views between Nozick and Rawls occupies centre stage in the arena of political/moral philosophy (Rothenberg, 1983). Very briefly, John Rawls' (1972) arguments revolve around two principles: The first is that people are entitled to basic freedom only to a degree that is consistent with others having equal access to freedom. The second principle (the difference principle) requires that economic and social inequalities, which can be justifiable, be arranged in such a way that they benefit those who are least well off. Robert Nozick (1974; 1981) is a libertarian. He argues for a necessary minimum of all forms of restraint, taxation, government or social and economic redistribution. One's responsibilities are to one's self; one may be charitable to others to any degree that one chooses; but, one may not morally be forced to cater for their needs. The similarity is considerable between the 'us'/'not us' paradigms identified here and the libertarian/egalitarian views of Nozick and Rawls. That similarity supports the view that the study has identified fundamental differences in the way people view their responsibilities in relation to environmental

issues.

4.5 DISCUSSION

This study has focussed upon the environmental perceptions and associated problems that provide the essential nature of a New Zealand strategy for environmental education. Three policy issues were seen as being associated with an examination of the notion of 'worthy environmental problems':

- the identification of a framework capable of providing direction for a New Zealand strategy based around problem solving;
- the distillation from the framework of a content definition capable of communicating to teachers and curriculum designers the broad features of 'that which is to be taught' in the name of environmental education in New Zealand; and,
- the examination of the hypothesis (and the implications of the hypothesis) that environmental problems arise from a paradigm.

I wish now to examine the results of the study in relation to each of these three objectives.

4.51 ENVIRONMENTAL PARADIGMS AND ENVIRONMENTAL EDUCATION

The most fundamental of the findings to emerge from the social survey of environmental experts is the uncovering of two paradigms beneath the panel's judgements about environmental problems. One of those paradigms encapsulates the beliefs that underlie environmental education. The second takes the opposite stance on most issues. There is at least tentative evidence for the

two-paradigm interpretation presented above. While it is clearly in need of further examination and confirmation, I consider the evidence for the two-paradigm interpretation presented here to be sufficiently robust to place weight upon its several implications. In particular, there are three implications that have significance for environmental education in New Zealand:

- the paradigm that embodies the notion of environmental education can be regarded as a particularly fundamental expression of the philosophy of environmental education;
- environmental education should be regarded as moral education; and,
- the moral viewpoint of environmental education is contested by an alternate set of beliefs.

Each of these implications is further discussed below.

The first implication of the paradigm structure identified here is that the philosophy of environmental education is encapsulated by the paradigm which embraces it. The results of the factor analysis study suggest that environmental education seeks to ingrain within our beliefs and established ways of doing things (i.e. within our culture) greater responsibility towards others - other cultures, other generations, other species. In particular, it seeks to remedy existing causes of disadvantage to those same others, that result from our past or present cultural practices. This statement of the nature of environmental education has the advantage that it leads to a clear definition of an environmental problem. An 'environmental problem' is, in fact, actual or potential disadvantage falling to another culture, generation or species as a result of our culture.

The second implication of the paradigm structure revealed in the survey study is that environmental education should be regarded in part as moral education. While it proceeds by way of problem solving (its motive power) the direction in which environmental education travels (its compass) is provided by a moral philosophy dealing with our responsibility toward others. Two matters should be noted in relation to this implication. The first is that both motive power and direction finding are necessary if environmental education is to reach appropriate destinations. Without a moral compass environmental education programmes may address the wrong problems. A number of 'wrong problems' were outlined in the introduction to this study. Without a problem solving methodology no progress will be made towards resolving problems. The second matter of note is that schools seek to import a morality only where those beliefs are widely sanctioned by their society. Once, again, questions to do with the purposes of schooling are raised.

The third implication of the paradigm structure revealed in the survey study is that the moral philosophy of environmental education is contested by an alternate set of beliefs. The beliefs of which environmental education is a part cluster around the holistic, everything-is-connected-to-everything-else viewpoint of the discipline of ecology. I have suggested that the alternative viewpoint is more closely related to neoclassical economics. A conflict between human centred (or anthropocentric) valuations of the world characteristic of economics on one hand and ecological (or ecocentric) valuations on the other is well recognised in the emerging field of environmental ethics (see Scott, 1986 a, b). Very briefly, that conflict is over the value of - and hence the extent of human responsibility toward -

other species, other generations and other societies. Those philosophical arguments are as yet unresolved. In other words there is as yet no uncontested philosophical grounding or justification for the moral beliefs within environmental education. This further limits the use of schools as a platform for the moral and social changes sought by environmental educators.

4.52 A NATIONAL FRAMEWORK

The Belgrade Charter (chapter two and Appendix 2A) suggests that national strategies for environmental education should be based on national environmental problems. The Charter recommends that each nation "clarify for itself" the basis of its environmental and social priorities "with an extension of that clarification and appreciation to other cultures, beyond one's own national boundaries". In this study I have invited a panel of national environmental experts to undertake these tasks.

The 46 problem statements set out in Appendix 4C represent the environmental problems perceived by those who know most about the New Zealand environment. The first and most significant aspect of those results is the way in which they replicate the framework expressed in the Belgrade Charter (Appendix 2A). At international level the problem statements deal with the need for action on nuclear disarmament, and the eradication of poverty, exploitation and dominance. They also identify a broadly parallel set of issues within New Zealand. I am satisfied that the set of 46 problem statements is both sufficiently representative of the intentions of international environmental education and sufficiently comprehensive to be taken as a framework for a New Zealand strategy.

4.53 A CONTENT DEFINITION

The 46 environmental problem statements can be regarded as the raw material for curriculum building. In the same way as a conventional school curriculum is built out of the facts and principles of its parent academic discipline, so a curriculum in environmental education might be built around environmental problems and environmental problem solving. I do not intend to undertake a curriculum building process here. However, I do wish to satisfy the requirement noted in chapter two for a communicable definition encapsulating 'that which is to be taught' in the name of environmental education in New Zealand. The content dimension of an environmental education strategy might best be expressed as a small number of broad themes expressing the key issues embodied in the 46 problem statements.

The first and most obvious implication of the set of 46 problems is that there are too many of them. Some form of coalescing will be required. It is possible that a national curriculum might simply consist of the 46 problem statements. (During the course of this study many teachers wrote asking for copies of the second round survey booklet. A small number asked for class sets!) However, a national environmental education strategy that invited teachers to select a problem - any problem - and work it through would result in a piecemeal curriculum. To obtain the benefits of both systematic unfolding of issues, and of horizontal co-ordination, some kind of organisation will be required. Organisation and direction for a national environmental education strategy might best be provided by one or more integrating themes.

Several aspects of the results provide guidance for the

selection of integrating themes. The first of these is the general distribution of panelists concerns, the number of issues nominated and the average level of concern expressed in various broad issue areas. The second aspect of the results is the 10 mental groups of problem statements that were identified by factor analysis, while the third is the six factors themselves. I have already discussed the 10 issue groups and the six factors. It is also possible to inspect the results as a whole and to propose integrating themes.

The general distribution of panelists concern.

In keeping with their 'not us' views, the panel of environmental experts tended to regard global level problems as more pressing than local problems and other people's problems as more worthy than our own. In terms of both the number of issues raised and the importance that was attached to them, their concern was distributed as follows:

- greatest concern was attached by the panel to a group of national and global scale issues dealing with resource depletion. Respondents seemed strongly aware of New Zealand's limited resource base and of the consequent implications of global depletion rates for our society. Global population growth (the other side of the resource coin) was seen as a significant, but not critical problem. These concerns were summed up in problems 4, 5, 10, 12, 18, 29 and 37;
- strong concern was shown for a set of issues that together expressed unease at the direction in which political and economic forces are moving the global society. The general theme was that, increasingly, the achievement of military, political and corporate objectives is compromising

the resolution of human problems. Problems 3, 7, 13, 15, 16 and 25;

- moderate concern was expressed for national ecological problems. The number of ecological problems nominated by respondents was large in relation to other classes of environmental problems, but all were given similar and only moderate-to-low ratings of concern. Problems 1, 2, 6, 30, 33, 38 and 41;

- limited concern was attached to national pollution and waste management problems but some concern was expressed for the consequences of deliberate use of toxic substances that may have health implications for people. Problems 22, 23 and 24.

- limited concern was attached to national scale social issues, with the exception of unemployment which was rated highly. Cross-cultural conflicts were placed at or near the bottom of the list. Problems 8, 14, 34, 35, 42, 43, 44, 45 and 46.

Integrating themes based on the total set of results.

The task of constructing integrating themes need not retain the emphases that were imparted by the panel of experts. The panel as a whole had little regard for local scale social issues, for example. Integrating themes might therefore be based on an interpretation of the total set of problem statements, but without regard for the emphases given to them by the panel. If this approach is taken it should be noted that there are three strong themes that run through the results of this study:

- concern about the erosion of human welfare brought about by forces of a political, corporate or economic nature. This theme emerges on two scales. On a global scale it is expressed in

problem statements about armaments (particularly nuclear armaments), rich world-poor world divisions, geopolitical rivalry, population growth and multinational corporations. On a national scale it is expressed in statements dealing with unemployment, the low socio-economic status of Polynesians, increasing social pressure/dislocation, and declining opportunities for the pursuit of non-economic benefits and quality of life goals (tranquillity, recreation, friendship);

- concern over resource depletion and its implications for the future. Again, there are two scales. Globally, key resources are becoming scarce and expensive. Our descendants may suffer hardship as a result of our resource use behaviour. Nationally, we are seen as being particularly vulnerable because of our limited resource base, our lack of self-sufficiency and our past inefficiencies in the use of important national resources. We lack decision making procedures to ensure that national resources are used or not used in ways that provide the greatest benefit to all citizens, both present and future;
- concern about the consequences of our conversion of a southern hemisphere forested land to a replica of northern hemisphere, European pasture. New Zealand is a geologically and biologically unique country with many endemic species. As an agricultural society it is inevitable that, as natural systems have been modified and new species introduced, native species have been lost or endangered.

Put most simply, there are three themes and two scales. The scales are national level and global level. The

three themes are, social justice; resources and the future; and, biological conservation. The social justice theme is strongest at international level, where it re-emphasises the corresponding elements of the Belgrade Charter. 'Resources and the future' is of equal strength globally and nationally. Biological conservation (managing our national inheritance) is strongest at national level.

I regard these themes as being simple enough, comprehensive enough and relevant enough to form the basis of a national content definition.

SHORT DESCRIPTION

ISSUE CODE

1 CRAYGONE	Depletion and contamination of seafoods
2 WHALES	Conservation of whales
3 NEWPHILO	The need for a new ecologically sound social belief system
4 POPCRASH	World population growth and earth's carrying capacity
5 MTWELLS	Depletion of global fossil fuels
6 POSSUM	Noxious animals and their effect upon New Zealand forests
7 MONEY	Excessive use of economics in national goal setting
8 MALEDOM	Our European-male dominated society
9 PRETTY	Aesthetic aspects of town and country environments
10 SELBLOOD	Export of non-renewable resources from New Zealand
11 PLANCITY	Planning of cities - aesthetics, social environment, pollution control
12 TRANSITN	The transition to sustainable societies running on renewable resources
13 GLOBPOOR	Unequal division of resources between societies - global poverty
14 BYEFARM	Rural depopulation in New Zealand
15 BIGBANG	Nuclear war - consequences for New Zealand
16 NONUKES	Spreading global commitment to nuclear energy
17 FLOSION	Floods and erosion due to incorrect land use
18 BADMANGT	Bad decisions on the management of New Zealand's resources
19 TOSITOUT	Wasteful packaging
20 XSHYDRO	Too-rapid development of hydro-electric resources
21 ALCON	Use of electricity for aluminium smelting
22 PBINGAS	Use of lead in petrol
23 DISEASE	Effect of chemicals in the human environment
24 YUM24ST	Use of chemicals in agriculture
25 FREEINFO	Freedom of information
26 RECYCLE	Recycling of urban rubbish
27 CLEANH2O	Control of water quality
28 UTROFIC	Eutrophic pollution of central North Island lakes
29 LOWNZRES	Our lack of self-sufficiency in energy and resources
30 SAVEALL	The need for a national biological conservation policy
31 KEEPOUT	Bad management of private land
32 RAPIDLOS	Loss of wild and scenic rivers to hydro electric developments
33 WETLANDS	Disappearing wetlands
34 LOWMANA	Low status of Maori culture
35 C2H5OH	Increasing use of alcohol and drugs
36 COASTUSE	Planning for the use of coastal areas
37 TROPTREE	Loss of tropical forests
38 SAVETREE	Conservation of the central North Island rainforests
39 LOSTSOC	Our lack of identity and purpose
40 EDUCATE	The need for environmental education
41 NATPARKS	Protection and extension of national parks
42 DOLECUE	Social costs of unemployment
43 TENAKOTU	Maori language as a second official language
44 POPSTRUC	New Zealand's age structure and population future
45 LANDFITE	Confrontation over Maori land
46 NZPOOR	Poverty among New Zealand citizens

CHAPTER FIVE:

ENVIRONMENTAL EDUCATION IN EXISTING CLASSROOM PRACTICE

.. there is no more obvious approach to research on teaching than direct observation of the behaviour of teachers while they teach and pupils while they learn. Yet it is a rare study that includes any observation at all... [studies never] look into classrooms to see what the teacher actually teaches or how the pupils actually learn.

Medley and Mitzel, 1958

5.1 INTRODUCTION

During the early phase of its evolution in America, environmental education spawned a number of variants and mutations of the original idea. One consequence of the confusion over the true nature of environmental education has been the belief that New Zealand schools already have in place a number of programmes capable of being described as environmental education. "We already do a great deal of environmental education", I was once told by a senior official, "except in New Zealand we call it outdoor education". Subject experts in Social Studies, Language/English and Science also considered their existing curricula to contain strong elements of environmental education. All together, a good case could be made, and was made, for the view that nothing further needed to be done in the name of environmental education in New Zealand. One obvious way to examine the reality of this view was to investigate that nature of existing classroom teaching about the environment.

Two other justifications exist for the conducting of a programme of investigations into existing classroom practice. The first derives from the conclusions to chapter two. In chapter two I argued that the success or failure of curriculum innovations appears to have much to do with the clarity with which required changes are communicated to teachers. Specifying change clearly requires an understanding of both the intentions of the innovation (i.e. the goals of the change process) and current practice. The distance between the requirements of the innovation, properly implemented, and existing practice is the slack that needs to be taken in by an implementation strategy. The second justification for an examination of existing practice in relation to environmental teaching is that the whole area of environmental education is new to New Zealand. We have no subject experts in environmental education, no Teachers College courses and no curriculum developers. We are faced with many unknowns.

In more general terms, Josep Schwab has made a strong case for attention to practical realities in the context of all curriculum change (Schwab, 1969):

[There is always a] requirement that existing institutions and existing practices be preserved and altered piecemeal, not dismantled and replaced... the same requirements would hold for a practical program of improvement of education..and this would require that we know what is and what has been going on in American schools.

At present we do not know. My own incomplete investigations convince me that we have not the faintest reliable knowledge of how literature is taught in the high schools, or of what actually goes on in science classrooms..

What is wanted is a totally new and extensive pattern of EMPIRICAL study of classroom action and reaction; a study, not as basis for theoretical concerns about the nature of the teaching or learning process, but as a basis for beginning to know what we are doing, what we are not doing, and

to what effect - what changes are needed, which needed changes can be instituted, and how they can be effected with minimum tearing of the remaining fabric of educational effort.

Schwab is making very clear his belief that curriculum change should involve empirical study of what teachers currently do.

From the outset it seemed likely that New Zealand teachers did a great deal of teaching ABOUT and IN the environment. Many of our national curricula were re-written in the years between 1965 and 1975. The incorporation of environmental themes was a common characteristic of these new curricula. An analysis of the total written curriculum (Appendix 5A) introduced later in this chapter indicated at least 100 statements characteristic of environmental education. However, the extent to which these many opportunities were realised in the classroom, and even more importantly, the manner in which they were realised in the classroom, remained unknown.

5.2 THE RESEARCH PROBLEM

Several justifications supported the view that not enough was understood about the nature of environmental education in existing classroom practice. What was required, therefore, was an exploratory study of the existing classroom curriculum in environmental education. The study would be required to describe the nature and extent or frequency of those elements of existing practice that can be described fairly as environmental education. More formally, the aims of the study were these:

- to determine the extent to which elements characteristic of environmental education are provided for in existing national curriculum

statements (i.e. an analysis of the written curriculum);

- to determine the extent to which elements characteristic of environmental education appears in existing classroom curricula; and,

- to describe on the basis of the results obtained, the pattern of change in existing practice that is required to implement environmental education.

5.3 PRINCIPLES TO DO WITH THE COLLECTION OF DATA ON CLASSROOM EVENTS

Several methods exist for the collection of data on events within classrooms. These include informal observation, the use of rating scales, live observation and recording for subsequent analysis (Dunkin and Biddle, 1974). In the context of the present research problem, informal observation is little more than impressionistic and would be therefore of limited value. Rating scales were widely used in the earliest observational studies, which dealt largely with teacher effectiveness (Mitzel, 1960). They have imparted to the process of classroom observation an evaluative connotation that it has not entirely escaped, as events described later in this chapter will testify. Live observation is a widely-used technique. It involves the investigator or observer sitting within the classroom and making coded judgements on an appropriate instrument about classroom events as they are occurring (Dunkin and Biddle, 1974). Finally, audio or video recording is the method of choice where the pace of classroom events is likely to overwhelm an observer, or where more subtle processes are being investigated. In practice, there are two observational methods from which to select. These are live

observations with coded recordings and audio/video recording for later analysis. The former produces more observations of more superficial phenomena, although elements such as non-verbal behaviour can be recorded. The latter produces fewer observations that can be analysed in considerable depth to the extent that this is permitted by the recording technology.

Live observation of classroom teaching was selected as the most appropriate method for collecting data about environmental education in existing practice. The focus of the study was on the classroom curriculum, i.e. what the teacher brought forward as 'that which was to be learned'. It was very unlikely that new material would be introduced at such a rate that an observer would be overwhelmed. It was also considered unlikely that 'that which was to be learned' would be so subtle that only analysis of recordings would reveal its true nature.

5.31 OBSERVATIONAL STUDIES OF LIVE TEACHING

Principles for the design and conduct of observational studies on teaching are reviewed by Medley and Mitzel (1963); Biddle (1967); Dunkin and Biddle (1974) and Herbert and Attridge (1975). Most studies reviewed by these authors were conducted for the purpose of examining theories of instruction (Dunkin and Biddle, 1974). The studies examine variables such as the sequence of teachers questioning (Nuthall and Lawrence, 1965), open vs closed questions (Wright and Nuthall, 1970) and teacher 'warmth' (Rave, 1973). The effect of alterations to these variables is examined on classroom events or student outcomes. Several standardised and validated instruments exist for the recording of classroom events to do with more common topics of interest, such as the Florida Taxonomy of Cognitive Behaviour (Brown, et al.,

1968). However few studies have set out simply to describe aspects of the classroom curriculum. Both conceptually and methodologically, the description of the classroom curriculum is less demanding than a typical live observation study.

Studies involving the observation of classroom behaviour can be methodologically complex (Herbert and Attridge, 1975). In particular, they involve decisions in four key areas (Dunkin and Biddle, 1974):

- there must be a unit of analysis. What are the 'things' that are being counted, categorised or rated?;
- a research instrument is required which unambiguously describes the events sought and allows the recording of results for subsequent analysis;
- issues must be resolved to do with the selection of a sample from the large number of available schools/curricula/classrooms; and,
- appropriate levels of reliability and validity should be demonstrated.

The unit of analysis.

The unit of analysis defines the events being counted or recorded (Dunkin and Biddle, 1974). These may be certain kinds of acts, like questions or disciplinary events, or they may be less clear cut, like 'teaching cycles', 'episodes' or the like. In general, the units sought in classroom observational studies are of two kinds - phenomenal units and analytic units (Dunkin and Biddle, 1974). Phenomenal units are natural events like questions (Kounin, 1970). No special training is required to identify them. Unfortunately, a minority of classroom events are captured by phenomenal units.

Analytic units are those in which a series of events of interest, which may be of variable duration or extent, is defined and becomes the unit of analysis (Smith and Meux, 1962; Bellack et al., 1966). For example, Smith and Meux (1962) used an analytic unit called an 'episode' to refer to a sequence of events involving a teacher question, a student response and a teacher evaluation of that response. Analytic units generally involve no fixed time duration.

The research instrument.

Instruments for the recording of observational data come in two forms - those intended for sign observations and those intended for category observations (Medley and Mitzel, 1963). In sign observations the observer is given a list of events to watch out for in the classroom. The observer checks those that occur in the nominated time period. Little in the way of judgement is required from the observer. Students either read from each others' writing or they did not. Categorised observation requires that the observer make a judgement by assigning each event of the kind under study to one of a number of categories. Categorical observation is more sensitive than sign observation and as a result is more widely used (Dunkin and Biddle, 1974). However, it also requires some evidence that the observer(s) are making accurate categorical judgements. The more complex the judgements required from observers, the more evidence of accuracy that is required.

In a categorical study the definition of categories to which events are to be assigned requires care (Dunkin and Biddle, 1974; Herbert and Attridge, 1975). Two matters require close attention. One is the clarity with which categories are stated. The other is the coverage of the

concept universe by the total set of categories. With respect to the first of these matters, Dunkin and Biddle (1974) point out that the meaning of any category depends upon both the way in which it is described and the other categories with which it is opposed. Both Guttman (1954) and Bellack et al., (1966) use the term 'facet' to describe a clear, mutually exclusive set of categories such that all examples of events sought will fit into one of them. Dunkin and Biddle (1974) state that they "...recommend the use of multifaceted categorised instruments in exploratory research".

Sampling problems.

Observational studies of classroom teaching present severe sampling problems. The origins of those problems are set out most succinctly by Dunkin and Biddle (1974):

The basic difficulty with research on teaching is that it is expensive. Even live observation entails the salary of the coder who is to sit in the back of the classroom... [Only] a few investigators have managed to secure resources sufficient to process data from more than a handful of lessons.

A second problem concerns the fact that teaching is conducted by and for human beings - and usually in the privacy of the closed classroom. Some teachers view the prospect of their efforts being observed with alarm, while administrators and parents may consider the prospect of conducting research on their pupils with asperity. For these reasons most research on teaching has concerned itself only with teachers who volunteered to participate, and who thus may have been better-than-average teachers, on the average.

Still another problem concerns the enormous number and variability of classroom lessons available for study... Perhaps a hundred different subjects are regularly offered in contemporary schools [in the USA]. Classrooms differ depending on whether they are urban, suburban, or rural;.. first, sixth or twelfth grade; conducted in a traditional manner or using one of the newer curricula or media. With such numbers and variability it is difficult to define a universe from which one might sample, let alone draw a sample that might be representative of

that universe.

The point made by above Dunkin and Biddle is that a complex of problems makes it impossible to undertake rigorous sampling of classrooms for observation. They go on to consider whether the results of observational studies have any general meaning given these problems. They conclude that results do have meaning, on two grounds:

- many studies involve gross effects, rather than fine processes. They are therefore unlikely to be context specific; and,
- several of the major findings from observational studies have been validated by two or more studies from different classroom settings (Dunkin and Biddle, 1974).

However, these are not strong grounds for assuming that results may be generalised. The extent to which one classroom is like another remains uncertain. The classroom researcher proceeds largely on faith that the phenomena being explored (at least in his/her own case) exist in classrooms beyond those observed.

Reliability and validity.

As with any measurement problem in social science, issues to do with reliability and validity must be considered. In the context of the measurement of teaching, 'reliability' indicates the extent to which measurement produces the same score in repeated application to the same teaching event. Validity means that the measurement process measures what it is held to be measuring (Dunkin and Biddle, 1974).

Strictly speaking, reliability is a property of the

measures obtained (Herbert and Attridge, 1975) and not of the observer or the instrument alone. Because of this, methods of collecting and manipulating data to reveal reliability coefficients can be particularly complex (Medley and Mitzel, 1958; Herbert and Attridge, 1975). They can become experimental studies in their own right. However, the key issue to be settled by way of a reliability coefficient is whether the measurement process had a reliability sufficient for the purpose for which it was used (Medley and Mitzel, 1963). Exploratory and descriptive research is less demanding than studies involving hypothesis testing. The most widely used and straight forward method of obtaining a 'reliability' measure is that of the coefficient of observer agreement, or COA (Herbert and Attridge, 1975). The COA is a correlation between observation scores obtained by different observers interpreting the same classroom events. It is considered to be a good indicator of the objectivity with which events are being measured (Medley and Mitzel, 1963). However, despite its popularity, it is not a true measure of reliability (Herbert and Attridge, 1975).

Validity is a difficult quality to establish in relation to studies of classroom teaching. For that reason it often receives only limited attention in reports (Herbert and Attridge, 1975). As with the attitude survey described in chapter four, validity may take four forms:

- content validity, which refers to the degree to which the items on the instrument cover the universe of events to be explored;
- construct validity indicates the extent to which the theoretical underpinnings of the instrument have logical or empirical support;
- criterion-related validity refers to the

relationship between scores on the instrument and performance on some other related measure; and, - face validity. Ways are cited in which the instrument is judged to measure what it is held to measure.

5.4 THE RESEARCH DESIGN

The resolution of the research problem outlined in Section 5.2 required attention to each of the design elements set out in the previous section. However, two design elements stood out as being particularly problematic. The first was the designing of a "multifaceted categorical instrument" (Dunkin and Biddle, 1974) i.e. the describing of a full set of classroom events covering the universe capable of being described as environmental education. The second problem was that of sampling. A preliminary analysis of the written curriculum (Appendix 5A) suggested that all school levels from J1 (five years of age) to F7 (17 years of age) potentially involved a classroom curriculum in environmental education. Equally, several subjects at each year level were candidates for observation. Potentially, there were as many as 100 subject/year curricula to be selected from, without consideration of such variables as city school vs rural school and public school vs private school. A small army of observers was implied.

The solutions chosen to the problems of sampling and instrument development were as follows: The sampling problem was reduced to manageable size in three ways. First, by developing a set of priorities for observation, based on the incidence of 'environmental education-like' statements in the written curriculum. Second, by

confining observation to a single set of adjacent schools in one urban educational catchment (several primary schools, one intermediate school and one secondary school). Reducing to an absolute minimum the need for travel between observations more than doubled the number of observations that could be returned by each observer. Third, the sampling problem was reduced by recruiting a small, small army of observers. The problem of developing a multifaceted categorical research instrument was approached by referring back to the process definition of environmental education developed in chapter two and the framework developed in chapter four.

5.41 THE THEORETICAL BASIS FOR THE RESEARCH INSTRUMENT

Before one can claim to have described the extent of environmental education in existing practice, one must have had a basis for recognising it when it is seen. The present study required a basis on which unequivocal distinctions could be made between environmental education and other forms of instruction. Given the debate and uncertainty about what environmental education is and is not, this distinction was not an easy one to develop. The study also required that the total set of component parts of classroom environmental education be distinguishable one from another.

The process of developing a facet describing classroom environmental education was begun by referring back to the process model introduced in chapter two. For convenience, this definition is re-introduced in brief here (Figure 5.1). The model deals in the kinds of classroom instruction that may follow the nomination of an environmental problem. According to the model, environmental education is directed towards the

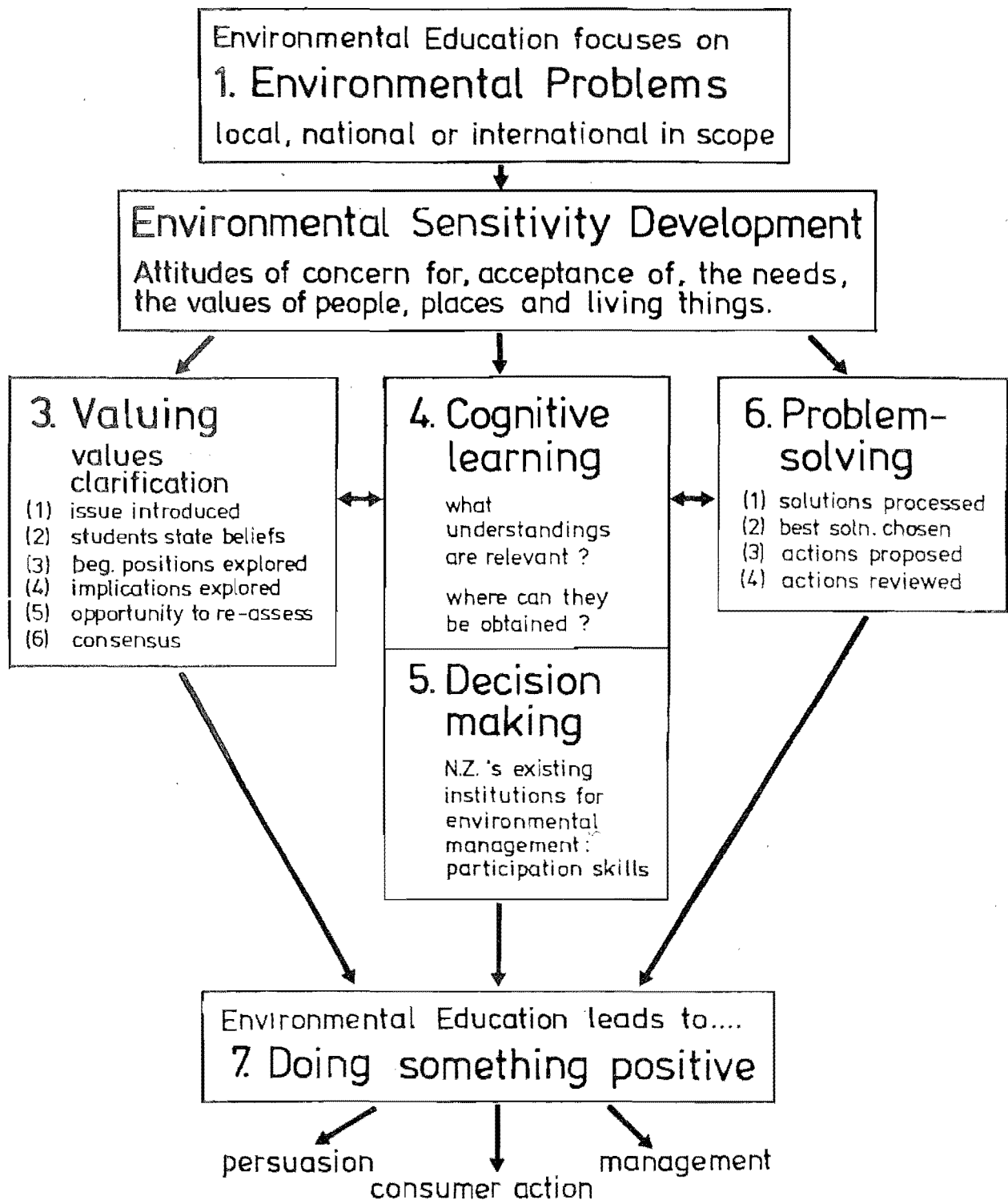


FIGURE 5.1: The process model introduced in chapter two was used as the theoretical basis for a research instrument.

resolution of an environmental problem. [However, the problem need not be stated explicitly - more of this later]. Once an environmental problem has been nominated, then the instruction or activity that follows is categorised according to its intentions. Six classes of intentions are recognised:

- values directing. The instruction is intended to develop in students specific attitudes with respect to the environmental problem. Normally these will include attitudes of concern or commitment. I have referred to this as environmental sensitivity development;
- values clarifying. Environmental problems may be social issues, in the sense that different groups in society hold opposing views. Instruction may be directed towards exploring different value positions, learning to better understand other people's beliefs, or seeking a consensus about what should be done;
- problem solving. Instruction is intended to examine and evaluate alternative ways in which the problem or issue can be resolved or made less severe. The problem may be clarified, possible solutions outlined and debated, and a best solution chosen;
- cognitive learning. Teaching may have the intention of imparting facts and principles to do with the problem. Cognitive material may be sought on a 'find when needed' basis, or it may be provided in advance, to be drawn upon as required;
- decision making. Society has a number of institutions with their associated laws, policies and practices by which the national environment is managed. Teaching may be directed towards informing students about these institutions, their

roles and responsibilities. Participation skills may be developed; and,
- problem solving action. Finally, environmental education may involve students in actions which contribute to the resolution of problems.

Following the approach of Dunkin and Biddle (1974) and Guttman (1954) the above set of descriptions of aspects of environmental education is regarded here as a facet - i.e. it is considered to be a complete, mutually exclusive set of descriptors of alternative kinds of instruction characteristic of environmental education. Environmental education can involve environmental sensitivity development (values directing) values clarification, problem solving, cognitive learning, decision making or action. Any instructional event capable of being described as environmental education can be assigned to one and only one of these categories. Environmental education does not involve any strategy of teaching and learning that cannot be assigned to this primary facet. On these grounds activities such as school camping, finding the oxygen content of air and learning the carbon/oxygen cycle are not of themselves examples of environmental education.

Five of the six elements of the primary facet were then expressed as facets in their own right. The sixth primary element dealing with action strategies required no further subdivision. This complete listing of the elements of environmental education is given below. Often, the sub-categories of a primary element were sequential, in that they were logical steps in the further development of that aspect of environmental education. For example, the element 'problem solving' was resolved into four mutually exclusive, sequential

events:

- necessary information and/or skills were assembled;
- students proposed one or more possible solutions to the problem;
- a best solution was chosen; and,
- ways of implementing that solution were considered.

The element to do with valuing was sub-categorised in a similar, sequential manner.

Once the categorisation and sub-categorisation of the elements of environmental education was complete, the listing of elements was referred to a panel of disciplinary experts for comment. This group consisted of lecturing staff from Christchurch Teachers College and local Department of Education and Board of Education subject advisors. No changes were recommended. The listing of elements was also referred to the sponsors of the study, Curriculum Development Division (CCD) of the Department of Education and the Commission for the Environment. CDD staff expressed a strong interest in extending the list of cognitive elements, particularly those characteristic of social studies teaching. After some negotiation the list of cognitive elements was increased to a total of 44 statements.

The complete listing of elements of environmental education is set out below. The list is set out as elements in the primary and secondary facets, together with any tests that were considered necessary.

The list of elements of environmental education.

SIGN DECISION

An environmental problem facing students or their society was part of the substance of the lesson. Test on 'environmental': to do with the physical, biological, socio-cultural, economic, resource or aesthetic environments at local, national or global scale. Test on 'problem': at least an implication that things are not as they should be.

CATEGORICAL DECISIONS

A. Sensitivity development (values directing). Test: teaching intended to evoke feelings/emotional responses about the subject/problem.

Subcategories of sensitivity development:

- direct experience of the emotional properties of the subject/problem ("smelliness"; "freshness");
- teaching directed towards the evoking of sensory or emotional responses;
- the recorded feelings/emotions of others about the problem are considered (literature, music, visual arts); and,
- students express feelings or emotions about the problem.

B. Cognitive learning. Facts or principles to do with the problem put before the class.

Subcategories. Finally, 44 subcategories describing cognitive topics were added to the instrument (Appendix 5B).

C. Problem solving. Test: students were considering the question, "what should we do about

it?"

Subcategories of problem solving:

- information or skills appropriate to problem solving assembled;
- one or more possible solutions proposed by students;
- best solution chosen from at least two alternatives; and,
- ways of implementing the solution planned.

D. Valuing. Students consider environmental issues where a key ingredient in the problem is a fundamental conflict of belief: Test on 'issue' - students are stating and justifying different beliefs about the subject/problem.

Subcategories of valuing:

- students have unhindered opportunities to express their beliefs;
- opportunity is made to find out more about one or more stated beliefs ("why do you believe...?");
- the implications or consequences of one or more beliefs are explored ("What would happen if...?");
- procedures are used which permit students to acknowledge a change of belief; and,
- an attempt is made to determine if there is a consensus ("Is there anything we can all agree on?").

E. Decision making. Information or activity is introduced to do with any national (or international) institution with management responsibility for some part of the environment.

Subcategories of decision making:

- the role of a decision making body is introduced;
- avenues are considered for citizen participation in the work of that body;
- participation skills are developed; and,
- participation is initiated.

F. Action. The students were involved in self-directed non-compulsory activity intended to contribute to the resolution of an environmental issue or problem.

The further development of the list of elements through to an instrument for classroom research was undertaken during the training of the observers. Since it was they who would be required to use the instrument, the task of setting it down was done in close conjunction with their requirements.

5.42 ISSUES TO DO WITH SAMPLING

Sampling can present severe problems in studies involving the observation of classroom teaching. The nature of these difficulties has been outlined in Section 5.31. The fundamental difficulty facing this study, to a greater degree even than most studies involving live observation, was the size of the total universe of subjects and levels that potentially was of interest. Perhaps as many as 100 subject-level combinations (e.g. Science at standard four) were candidates for observation. On one hand, the objectives of the study would not be met by concentrating on a detailed description of the environmental education components of one or two subjects at one or two levels. Such a focus

would be too narrow to be of any value. On the other hand, there was equally little value in unreplicated observations of almost every subject taught in almost every kind and level of classroom, school and community. A compromise of majestic proportions was called for. The sampling problem was reduced to manageable proportions in three ways. The first involved the formulation of a set of priorities for the allocation of available observer time, based upon an analysis of the written curriculum. Those curricula most likely to contain elements of environmental education were accorded most observer time, and vice versa. The second involved the selection of a geographically close set of five schools in a single urban educational catchment. Their closeness minimised time lost in travel between schools. The schools were urban state schools representative of those in which the majority of New Zealand children receive their education. Three were Primary schools (ages 5-12); one was an Intermediate school (ages 11-12) and one was a Secondary school (ages 13-18). The third way of coping with sampling problems was to obtain sufficient resources to recruit a team of eight teachers for a period of six months. The teachers were to be trained as classroom observers. The combination of eight observers for six months, the proximity of the schools and the priority system for observation meant that it should be possible to collect 2 000 lesson observations. There would be no less than 20 observations of any one subject/level of lowest priority and as many as 200 of each highest priority curriculum.

Issues to do with the analysis of the written curriculum and the securing of involvement of teachers and schools are dealt with below. The selection and training of the observer team are considered later under a separate

heading.

The analysis of the written curriculum.

The research design outlined here required that observations be distributed across subject/levels according to the probability that environmental education would be encountered therein. This in turn meant that the recruitment of both the schools and teachers to be observed, and the observers would also be based on the broad outline of the distribution of environmental education-like statements through the written curriculum. analysis of the written curriculum.

The analysis of the written curriculum encountered two problems. The first involved curricula not recently reviewed that have evolved in their normal interpretation well beyond the last written statement. The second involved uncertainty about the kind of instruction implied by curricula that are expressed in process terms. It became clear that the state of the art in a number of national curricula has evolved well beyond that which is expressed in the most recent written statement that could be found. In one or two extreme cases no record could be found at all of the last written statement. In any curriculum where there was uncertainty, the current state of play was assessed with the assistance of the same panel of disciplinary experts involved in the development of the categories for the research instrument. The second problem involved curricula that were expressed in process terms, such as Language/English. These flexible curricula permitted the use of any amount of environmental material as the substance for the process dimension of the lesson, depending on the teacher's interests. Once again, decisions regarding the distribution of observations were based on assessments

made by subject experts about the normal treatment of that curriculum. The analysis of the written curriculum is shown in Appendix 5A.

The completed analysis of the written curriculum provided the basis for some preliminary decisions to do with observers, teachers and schools. A team of eight observers was recruited from teachers whose subject specialties matched the proposed distribution of observations. Schools were selected and contact was made with teachers whose participation was desired.

Protocols and permissions.

Once the general outline of the experiment was in place contact was made with those whose involvement or sanction would be required. An outline of the intentions and methods of the study was prepared and presented to the principals of five schools. After obtaining preliminary, "subject to.." approvals, arrangements were made to speak to teachers at the schools. Voluntary participation was invited. The response from teachers was good. Finally, sanction for the study was obtained from: the Governors of the High School; the Canterbury Education Board; and, the Regional Office of the Department of Education. Consents were not initially sought from teacher unions. Their request for consultation was received two days before observations were to begin. Negotiations with teacher unions took nine weeks and substantially reduced the planned number of observations.

A further difficulty was encountered when one of the primary schools that initially agreed to take part encountered staffing difficulties after a staff member died. I considered it appropriate to withdraw from planned observations at that school. Once the study was

able to begin it involved two Primary schools (13 teachers), one Intermediate (9 teachers) and one Secondary school (24 teachers).

5.43 THE UNIT OF ANALYSIS

The objective of this programme of classroom observations was to set down a description of the existing classroom curriculum in environmental education. The classroom curriculum consists of all of 'that which is to be learned' as it is presented to students by teachers. In any given classroom, therefore, the classroom curriculum in environmental education involves all the 'learnable material', in both content and process terms, that has these two characteristics: First, it is capable of being characterised as environmental education according to the scheme introduced earlier, and second, it is introduced to the class by the teacher with the intention that it should be learned.

The term 'instructional unit' was used to describe a single lump of classroom instruction. The teaching/learning activity in an instructional unit in environmental education could be directed towards any of the kinds of educational intentions listed as making up environmental education - sensitivity development, valuing, cognitive learning, problem solving or action by students. A given instructional unit was considered to continue for as long as the teacher's instructional intentions remained directed towards the same goal or goals. The teachers intentions were also used to distinguish between 'instruction' and other kinds of classroom activity, such as organisation or discipline. The use of the unit of analysis defined here involved repeatedly addressing the question, "What is the teacher trying to achieve here"? Since this was a judgement most

reliably made by another teacher, a high priority was placed on obtaining sufficient resources to employ teachers as observers.

5.44 THE SELECTION AND TRAINING OF THE OBSERVERS

The initial planning of this classroom study coincided with a sharp reduction in the number of children entering New Zealand schools. This in turn resulted in a pool of unemployed teachers. Decisions made by the Minister of Education limited special consideration to those teachers who were actually employed as teachers at the time the roll reductions occurred. The effect of this was to create a pool of (now former) teachers who had been overseas, at University, or otherwise temporarily outside the profession at the time the new staffing measures were introduced. While these teachers had very limited chances of re-entering the profession in the immediate future, they were eligible for a term of employment not exceeding six months on a Government funded project employment programme. A Government surplus of teachers - a temporary surplus as events have transpired - coincided with a need for teachers as classroom observers in this study.

Funding was therefore obtained from the New Zealand Department of Labour to select and train a group of eight unemployed teachers as classroom observers. The duration of employment was to be six months. All those selected for the team were trained teachers. Several had a number of years' classroom experience. Collectively, their specialist subjects and levels matched the proposed distribution of observations.

Training of the observer team involved first introducing them to the concept of environmental education, and then

providing practice at lesson interpretation. The training in environmental education followed that now set down in the introduction to the New Zealand Sourcebook (Scott, 1984). The practice at lesson interpretation involved observers in taking turns to deliver a lesson characteristic of their specialist subject and level. Each lesson was tape recorded. Using as a guide the listing of elements of environmental education (Section 5.41), the environmental education content of each lesson was first identified, then discussed at length and finally categorised. Observers were encouraged to examine the adequacy of the categories, the wording and the tests. They were also encouraged to consider how the list of elements might best be set out as a research instrument. A number of changes in layout and wording were made during the first 35 practice lessons. Progressively, the listing of elements of environmental education evolved into a research instrument for classroom use. The final form of the instrument is set out in Appendix 5B.

The initial coefficient of observer agreement. (COA)

The COA is the most widely used and simple method of obtaining a measure of the reliability of observations (Medley and Mitzel, 1963). It involves some form of measure of the percentage of agreement between observers, usually between pairs of observers (Dunkin and Biddle, 1974). In a detailed study of aspects of the reliability of observational studies, Medley and Mitzel (1958) reported COAs in the range 0-0.96. Typically they were in the range 0.6-0.7 (on a scale from 0 to +1).

The COA developed here to quantify the accuracy with which observers interpreted lessons was in the form of an index number, similar to that used by Scott (1955). The

index number took account of both types of possible errors - the recording of false positives and the failure to record true positives. Numerically, it allowed values from a high of +1 (all positives correctly noted; all negatives correctly ignored) to a low of -83 (one true positive ignored; 83 false positives recorded). For all reasonable practical purposes however, the formula generated a scale from -1 to +1.

Twenty five further trial lesson interpretations were conducted and scored. A coefficient of observer agreement was calculated for each observer after each lesson. Mean COAs for the team are recorded in Figure 5.2. Once again, observers took turns to deliver a lesson characteristic of their subject. The remainder of the team scored the lesson for its environmental education content. The lesson was then discussed in detail and sometimes replayed from tape. The correct interpretation was agreed upon and each observer then scored his/her responses against the agreed solution. A target for the mean group score of greater than 0.8 was set. (This score was equivalent to a mean of 0.9 on a scale from 0 to +1). A mean of better than 0.8 was obtained on the 12th scored lesson and reasonably consistently thereafter. Attention was then devoted to the formulation of lessons designed to test the observers' decisions in a curriculum that had proven consistently difficult to interpret. The curriculum was Social Studies and the difficulty was that the lessons often involved environmental problems or issues that were not explicitly stated, but were behind the substance of the lesson. Once mean scores for these deliberately difficult lessons were consistently above 0.8, training in interpretation was discontinued and final arrangements were made for classroom observations to begin.

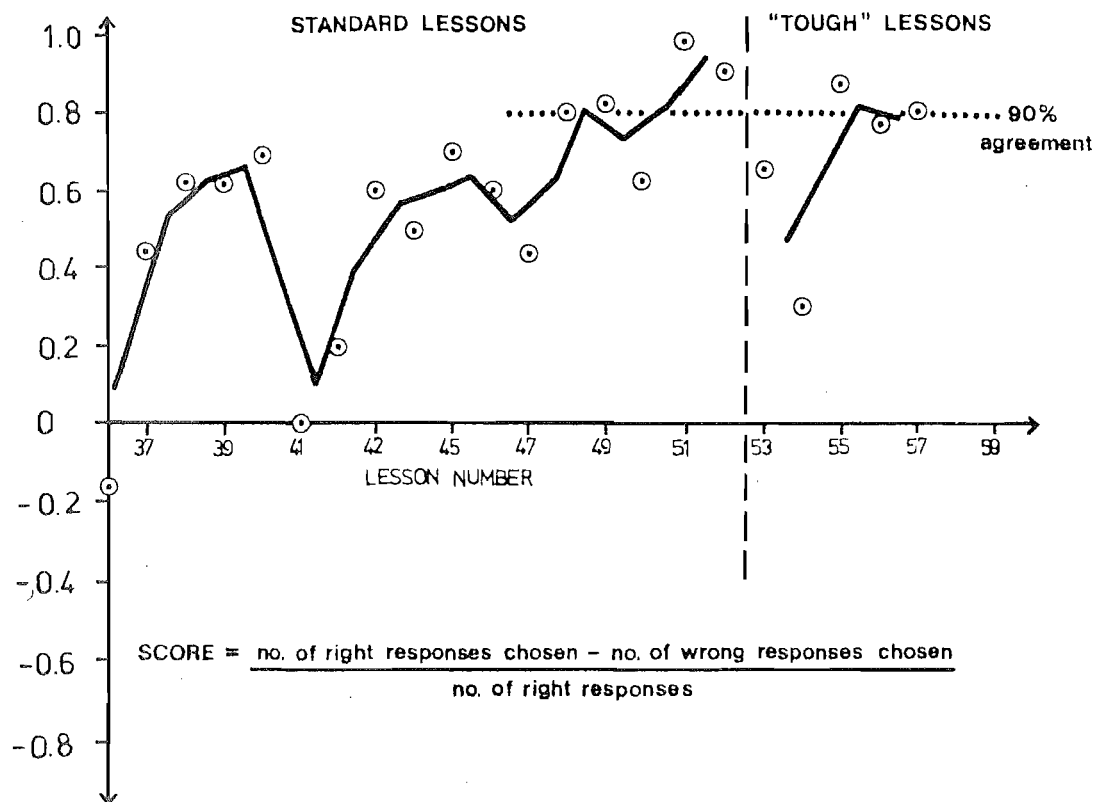


FIGURE 5.2: MEAN COA scores for the observer team during training. The points are connected by a line following two column running averages.

Loss of observation time.

However, before classroom observations could begin, representatives of both Primary and Secondary teachers unions intervened and prevented their members from participating. Several meetings were held with union representatives who made it clear that they wished to establish more definite rules for in-classroom research. There was an implication that unions found observational studies to have an evaluative connotation. Full details of the research protocol were provided. After nine weeks both unions withdrew their objections and the study was permitted to continue without modification.

However, the loss of nearly 40% of planned observation time required significant changes in the distribution of lesson observations. Two kinds of changes were required. First, the use of pairs of observers working together to produce regular COA measures was not proceeded with. Observers were confident that their interpretation of classroom lessons was at least as good as the practice lessons. Significant savings could be made by dispensing with paired observations. The second change involved a reduction in the number of observations of subjects and levels that were not top priorities. The number of planned observations were retained for the key subjects of Language/English, Social Studies/Geography, and Science and the key levels of Forms I-IV (11-14 years of age).

5.5 RESULTS OF OBSERVATIONS

The classroom observations collected during this study revealed a substantial curriculum in environmental education embedded in existing practice. More than half

of all lessons chosen for observation contained at least one instructional event capable of being described as environmental education. When allowance is made for the less environmental subjects that were not observed the results presented below suggest that around one lesson out of every four involved instruction that was in some way characteristic of environmental education. However, while the frequency of teaching about environmental themes was high, the nature of existing instruction fell short of that required by environmental education in several significant ways.

The results of classroom observations are set out below in the following way: First, results are considered at the most general level. The distribution of lesson observations through the total curriculum of the case study schools is introduced, followed by the results obtained under the six major headings of the research instrument. These general results indicate certain conclusions which are further explored in relation to the more specific results obtained in several sub-categories of the instrument. The presentation of results is completed by introducing some observations on the strengths and weaknesses of environmental teaching in different subjects and levels within the New Zealand school system. The results of discussions with participating teachers about the results are then introduced. Finally, questions to do with the validity and reliability of the observations are taken up.

The distribution of lesson observations.

Thirteen hundred and thirty two lessons were observed in 55 classrooms during 13 weeks of observations. The distribution of observations across subjects and levels is set out in Table 5.1. The curricula observed made up

TABLE 5.1: DISTRIBUTION OF LESSON OBSERVATIONS

LEVEL SUBJECT	ENT-J2	S1-2	S3-4	F1-2	F3-4	F5-7	SUBJECT TOTALS
LANG/ENGLISH	13	18	58	56	73	74	292
SOC.STUD/GEOG.	17	9	23	100	228	100	477
SCIENCE/BIOL.	2	5	22	29	147	8	213
ART	2	9	10	2	47	74	144
ECON.STUD/ECON.	-	-	-	-	17	59	76
OUTDOOR EDN.	-	-	-	19	-	-	19
HEALTH/HOME EC.	6	8	-	19	1	24	58
OTHER*	-	-	-	-	50	3	53
LEVEL TOTALS	40	49	113	225	563	342	1332

* includes integrated studies, social education, liberal studies

around one half of the total curriculum at the level of Forms 2-4 and tapered to perhaps one fifth of the total curriculum at junior primary and senior secondary levels. Potentially significant curricula for which no observations could be made, either because of the reorganised schedule or as a result of timetable constraints, included:

- Ecology section of Form 6 Biology;
- Man and the Biosphere Section, Form 7 Biology;
- Most of Forms 3-4 Economic Studies; and,
- Most of Forms 3-4 Home Economics.

Overall, however, it was possible to secure an adequate number of observations of those subjects and levels in which the pattern of teaching warranted observation.

The presence of observers in teachers' classrooms did not appear to have any marked effect on teaching. The study was conducted in an open manner, so that teachers were aware from the outset of the intentions of the study. They were given an open invitation to inspect the research instrument or the recordings made in their classroom at any time. Few accepted the offer. However, during the first week of observations several teachers appeared to have prepared special lessons for the benefit of observers. "Boy, have I got a lesson for you!" announced one teacher on arrival at class. Where there was evidence that the teacher was responding to the presence of an observer, the lesson was observed and coded in the usual way. Later, the recording was discarded. Eleven recordings of observations were discarded for this reason. By the end of the first week of the experiment, however, the observers felt that they were regarded by teachers and students as part of the furniture.

5.51 RESULTS FOR THE MAJOR ELEMENTS OF ENVIRONMENTAL EDUCATION

Overall, 58% of the 1 332 lessons observed contained at least one element of environmental education. The distribution of positive results across the major sections of the instrument is shown in Table 5.2. This table illustrates graphically the way in which the existing curriculum in environmental education is dominated by cognitive material. Nearly two thirds of lessons recorded as positive for environmental education contained cognitive elements alone. Those classes of instruction most characteristic of environmental education - problem solving, decision making and action-accounted for 1% of all lessons, or around 2% of lessons that were positive for environmental education. No lessons were seen that involved action. To sum up: the extensive existing curriculum in environmental education is dominated by teaching about the environment and involves little or no instruction of a problem solving kind.

Both the frequency and the kind of environmental education varied in a regular way with school level. Table 5.3 and Figure 5.3 illustrate these variations. In Table 5.3 the variation with school level is shown in the percentage of lessons observed that were seen to involve environmental education. The table also shows the percentage of observed lessons at each level that were positive for elements of environmental education other than cognitive teaching. These data suggest that the pattern of teaching at levels between new entrants and J2 is an exception to trends across the remainder of the school system. In the remainder of the primary school the frequency of positive lessons increased steadily.

TABLE 5.2: The distribution of results across the major sections of the research instrument.

	No. lessons seen	% of all lessons	% of EE positive lessons
Lessons containing no EE	562	42	-
Lessons developing sensitivity	195	15	25
Lessons involving valuing	67	5	9
Lessons introducing problem solving	9	0.7	1
Lessons introducing decision making	5	0.3	0.6
Lessons involving action by students	0	0	0
Lessons introducing EE content alone	494	37	64
Total no. lessons observed	1332	100	100

TABLE 5.3: OVERALL RESULTS BROKEN DOWN BY LEVEL

Level	Ent-J2	S1-2	S3-4	F1-2	F3-4	F5-7
Age	5-6	7-8	9-10	11-12	13-14	15-17
No lessons seen	40	49	113	225	563	342
<hr/>						
% positive for EE	45	33	54	70	61	51
% positive for process*	5	20	25	36	20	20

* 'process' here includes sensitivity, valuing, problem solving and action

TABLE 5.4: Teaching to do with the biological environment was dominated by cognitive elements.

CONTENT HEADING	NUMBER OF OBSERVATIONS
natural history	174
principles of ecology	94
conservation of species	3

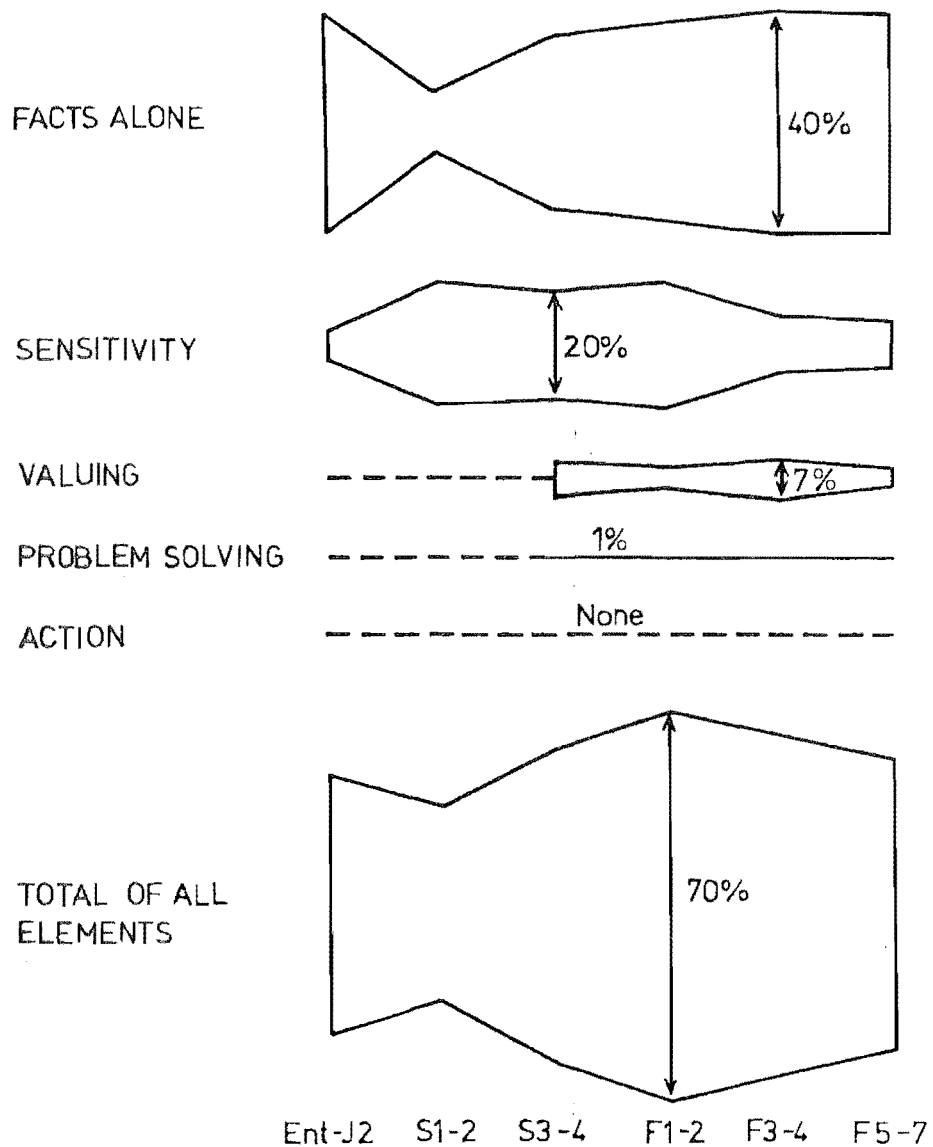


FIGURE 5.3: The distribution of frequencies with which the six major elements of environmental education were distributed across levels.

The frequency of 'cognitive only' responses remained around 80% from S1 to S4. The highest frequency of both positive lessons and of non-cognitive positive lessons was found in the nine classrooms observed at intermediate school level. Seventy percent of all lessons observed at this level contained some form of environmental education. Around one half of those lessons contained non-cognitive elements. In the secondary school the frequency of positive results declined with increasing level. The frequency of non-cognitive positive results remained constant at around 20% at all secondary school levels.

Figure 5.3 illustrates the way in which the five major elements of environmental education were found to vary with school level. The frequency with which facts and principles to do with environmental problems were introduced increased from S1 onwards. It reached a maximum in the secondary school at around 40% of all lessons observed. Teaching for environmental sensitivity was observed at a constant 20% of all lessons from S1 to the beginning of secondary school, where it declined to around 10% of observations (Table 5.5). Valuing was seen in a steady 4-7% of all lessons observed in the range between S3-4 and F7. A total of nine lessons (<1%) were seen to involve problem solving. No lessons involved action strategies.

No classroom based subject that was observed deviated from this pattern of domination by cognitive learning. The pattern of domination by cognitive elements exists throughout the data and emerges repeatedly. For example, the content section of the instrument included three headings for the recording of instruction to do with the biological environment: natural history;

TABLE 5.5: SENSITIVITY DEVELOPMENT BY LEVEL AND SUBJECT

Level	Ent-J2	S1-2	S3-4	F1-2	F3-4	F5-7
No. lessons seen	40	49	113	225	563	342
% sensitivity	5	22	19	22	11	8
<hr/>						
% sensitivity in:						
Social Stud./Geography	*	*	*	14	9	13
Lanaguage/English	*	24	28	30	23	4
Science/Biology	*	*	*	3	11	*
Art	*	*	*	*	0	19
Outdoor Education	-	-	-	95	-	-

* insufficient data (i.e. less than 25 observations)

principles of ecology; and, conservation of species. As Table 5.4 shows cognitive and theoretical aspects of biology were well represented in the classroom curriculum. Teaching about biological problems, on the other hand, was rarely seen. It should be noted that the period of observation included the national Conservation Week campaign.

The domination of environmental teaching by cognitive material gave rise to the phenomenon of teaching about an environmental problem without mentioning that it was a problem. This phenomenon was most frequently encountered at secondary school level and is best explained by reference to a 5th form lesson on water pollution. The lesson went like this:

The topic was introduced and the teacher defined three classes of water pollution - bacteriological, chemical and eutrophic. Each class was further defined and examples were cited. Eutropic pollution was singled out for more detailed discussion, including references to the nitrogen cycle and changes in the dissolved oxygen content of the water. The concept of biological oxygen demand (BOD) was introduced. The lesson concluded with students completing notes and exercises on the concepts introduced.

The lesson described above illustrates well the way in which environmental problems were dealt with in many classrooms, particularly in secondary school Science and Social Studies. The lesson centred around an environmental problem. However, there was nothing introduced which suggested to students that water pollution was in any way unacceptable or problematic.

There was no attempt to consider which local bodies of water were polluted, why they were polluted or what might be done to reduce the problem. Water pollution was studied at a theoretical level and represented as a normal part of the world. In Social Studies a similar approach was taken to topics such as rich world - poor world, social minorities in New Zealand and poverty.

The general pattern of results described above has two implications. The first is that there is clearly a curriculum in environmental education embedded in existing practice at all levels of the school system. Quantitatively this curriculum is of considerable magnitude. Qualitatively, however, it is dominated by the teaching of facts and principles about environmental problems. This is so particularly at secondary school level where the pattern of teaching tends toward the antithesis of that required by environmental education. The pattern of results from observations at intermediate school level came closest to that of good environmental education. However, further weakness in existing practice at all levels will emerge in the more detailed results that follow.

Before detailed results are considered, however, there is one further matter of a general nature that should be considered. It is that they show a high degree of internal consistency. Figure 5.3 illustrates the consistency within the total dataset and suggests strongly that real phenomena were being recorded in a consistent way. The data illustrated in Figure 5.3 was collected by eight observers working independently at the allocated subject/level combinations and unaware of the pattern of results returned by other observers. No numerical results were available until record cards were

read into a computer and analysed at the end of the experiment. The high degree of internal consistency suggests that the data warrants further disaggregation.

5.52 RESULTS IN SUB-CATEGORIES

In the sections that follow more specific results are introduced from sub-categories of the instrument. No action strategies were observed, so there is little to discuss in this category. The other categories of sensitivity development, valuing, problem solving and cognitive learning are discussed in turn. In each case the presentation of results is preceded by a brief discussion of how that class of environmental education instruction was conceptualised for observational purposes. In other words, what was found should be considered in close conjunction with what was sought.

Sensitivity development.

The category of environmental education called sensitivity development is considered here to involve instruction intended to develop attitudes appropriate to environmental problem solving. In other words, it is seen as values directing. The instrument allowed for the following kinds of instructional events to be recorded under sensitivity development:

- direct experience of the problem being studied. Effective audio-visual presentations were included under this heading (e.g. natural history films, but not wall posters);
- teaching directed towards evoking sensory or emotional responses. For example, "eyes closed and touch" activities; role play of fish in a polluted river;
- students express feelings or beliefs about a problem through writing, drawing or acting. For

example, a creative writing assignment on destruction of the forest; and,
- students consider the feelings of others expressed through literature, art.

When conceptualised in this way sensitivity development proved to be well represented in some parts of the existing classroom curriculum (Tables 5.2, 5.5, 5.6; Figure 5.3). It was consistently present in around 20% of lessons observed at all primary and intermediate school levels above the new entrants level. Secondary school lessons were positive for sensitivity development in around 10% of observations (Table 5.5). When broken down by subject and level (Table 5.5) Language/English and Outdoor Education stood out as the subjects contributing most of the positive results. Senior secondary school English was an exception to this result. Table 5.6 shows that when the results were broken down by instrument category the first three sub-headings were more or less equally well used. The fourth category, that of encountering the feelings of others, was seen less frequently. Other than direct experience of environmental problems (most of which was through the medium of film) secondary school teaching involved little sensitivity development.

From the point of view of classroom method the most effective technique seen for the development of environmental sensitivity was thematic teaching.

1. The selection of a topic that has environmental implications;
2. Development through a series of lessons spanning several days, or even weeks, in which the topic was examined from several standpoints and

TABLE 5.6: SENSITIVITY DEVELOPMENT BY LEVEL AND INSTRUMENT CATEGORY

Level	Ent-J2	S1-2	S3-4	F1-2	F3-4	F5-7
No. of lessons seen	40	49	113	225	563	342
<hr/>						
% lessons involving:						
direct experience	2	8	9	9	9	8
teaching for feelings	2	14	7	8	2	<1
feelings expressed	2	15	11	16	2	1
feelings of others	2	2	2	6	1	1

involved students in several activities, some of which (at least) were designed to involve feelings;

3. Direct experience of the topic (or a good audio-visual presentation); and,
4. Independent, imaginative or creative project work in which students expressed their feelings about the topic.

As an example of thematic teaching that provided considerable opportunity for sensitivity development, consider the following sequence, which was seen in several classrooms:

The topic was cars and their influence on our lives. It involved integration of Social Studies, Science and English teaching at Intermediate level. The sequence began with the film, The car, hero or villain? This was followed by class discussion centring around the question "What would it be like to live in a society without cars"? In one classroom this was followed by a unit of work on air pollution, and in others by studies of how cars work. Finally, students undertook a range of creative writing and drawing projects communicating their feelings about good and bad aspects of cars.

Thus direct experience of good and bad aspects of cars was combined with lessons that provided opportunities for feelings to develop, cognitive aspects of the topic to be learned and feelings of good and bad to be expressed. The absence of thematic teaching approaches at secondary level may contribute to the lower frequency of lessons recorded as positive for environmental sensitivity.

Valuing.

Many environmental problems become social issues, in the sense that there are divisions in society about what, if anything, should be done about them. Environmental education may therefore involve 'exploring' or 'clarifying' conflicting beliefs as a contribution to the valuing skills needed to resolve environmental conflicts. The categories of instructional events sought in this study as evidence of valuing exercises are derived from the pedagogy of values clarification (Raths, et al., 1966). There are other theoretical-methodological approaches to classroom valuing (see Kohlberg and Turiel, 1971; Kohlberg, 1973) but they do not appear to be well known in New Zealand. They also tend to involve the same kind of pedagogy as values clarification (in the sense that social conflicts are introduced and discussed) so that they would register on the instrument, anyway. Observers were on the alert for the use of other valuing pedagogies.

The use of the valuing sub-category of the research instrument was initiated by the introduction of an environmental issue. The instrument allowed for the identification of the following classes as instructional events:

- there was opportunity for a minimum of one student to 'say what they believed' about the conflict;
- selected beliefs were explored in greater depth;
- the consequences of selected beliefs were explored;
- there was opportunity for students to publicly acknowledge that they had changed their minds; and,
- there was an attempt to find, or implement, a consensus view.

The results presented in Table 5.2 and Figure 5.3 earlier show that 67 lessons, or around 5% of all lessons, involved some valuing. No valuing lessons were seen below upper primary level. Language/English again proved to be the most consistently values related subject, although the highest absolute frequency of valuing was seen in junior secondary Social Studies (Table 5.7). Overall, Social Studies was not significantly more values related than the average of all results. Almost no valuing was found in Science.

Table 5.8 presents valuing results broken down by instrument category. It illustrates clearly that the observed valuing only rarely went beyond a classroom discussion (instrument categories 1 and 2). Of the 67 lessons observed to contain valuing, nine were developed down to category 3 (consequences explored), four down to category 4 (acknowledge changed view), and three down to the last category (consensus). There was no evidence of any consistent use of an established pedagogy for classroom valuing.

It should also be noted that the majority of value conflicts seen were not particularly controversial - should N.Z. support the Royal Family; are co-educational schools the best; should we have a school uniform? There was an impression, which was strengthened by later discussion with teachers, of a reluctance on the part of teachers to bring into the classroom issues about which there are deep conflicts in our society. The small number of lessons seen to contain valuing that was relevant to environmental education occurred at junior secondary level, in English and Social Studies. Here there were lessons on trade unions, minority groups in

TABLE 5.7: VALUING BY LEVEL AND SUBJECT

Level	Ent-J2	S1-2	S3-4	F1-2	F3-4	F5-7
No. lessons seen	40	49	113	225	563	342
% valuing (overall)	0	0	6	4	7	3
<hr/>						
% valuing in:						
Social Stud./Geography			0	5	12	4
Language/English			10	9	9	0
Science/Biology			0	0	<1	*
Economics			-	-	*	11

* insufficient data

TABLE 5.8: VALUING BY LEVEL AND INSTRUMENT CATEGORY

Level	Ent-J2	S1-2	S3-4	F1-2	F3-4	F5-7
No. lessons seen	40	49	113	225	563	342
% valuing	0	0	6	4	7	3
<hr/>						
% lessons involving:						
students state beliefs			5	4	5	3
consider beliefs of others			5	3	3	1
consequences explored			0	1	1	0
own position changed			0	<1	<1	0
consensus attempted			0	<1	<1	0

N.Z. and overseas, crime and appropriate punishment and the role of women in society.

The content categories.

The final section of the instrument consisted of 44 categories that allowed the teaching of facts and principles about topics that are characteristic of environmental education to be recorded. This section of the study was significantly affected by the duration of classroom observation being reduced from a planned 22 weeks to 13. It is reasonable to assume that the frequency of process teaching such as sensitivity development, valuing, problem solving and action carried out by a given teacher will remain fairly constant throughout the year. A period of extended observations at any time during the school year ought to identify that frequency of process teaching. Content, on the other hand, depends upon the teacher's work plan. Facts and principles will only be introduced when the relevant topic is being taught. Observations extending over the greater part of the school year are therefore necessary to describe the frequency of introduction of content headings. While content plays a limited role in the concept of environmental education being developed here, it would have been useful to explore issues to do with the frequency and organisation of cognitive themes.

Nevertheless, the content section of the results is not without uses. In a number of cases the implications of data collected are so strong that it is very unlikely that more observations would contradict them. These implications are outlined below. In each case, the apparent finding was checked with relevant teachers, who were asked, "Would we have seen a different pattern if we had been in your room for the whole year"? Only those

for which the answer was negative have been presented here.

Some observations based on content data:

1. The biological environment (see Tables 5.4 and 5.9). Students in our trial schools appear to be taught a great deal of Biology. One fifth of all lessons observed contained elements of Biology. However, almost no attention is given to conservation Biology (with the exception of a short unit in Form 6 Biology).
2. Resource studies (Table 5.10) are dominated by studies of extraction and processing. Little attention is given to the distinction between renewable and non-renewable resources, or such concepts as stocks, reserves and sustained yield.
3. Social environment (Table 5.11). Topics dealing with other people and their lifestyles are conspicuously well covered.
4. Energy as a resource (Table 5.12). Little attention was devoted to the critical nature of energy as a resource. Teachers (with two exceptions) had not used the Energy Education programme materials in their schools.
5. Aesthetics (Table 5.13). Urban aesthetics appears well catered for in 6th Form Art. Environmental educators would probably wish to see elements of environmental aesthetics introduced in a less specialised curriculum.

Teachers' perceptions of the results.

When the results of this study were analysed, and the principal conclusions identified, I returned to the participating schools to discuss the study with staff

TABLE 5.9: BIOLOGICAL ENVIRONMENT

Level	Ent-J2	S1-2	S3-4	F1-2	F3-4	F5-7	Total
natural history	2	5	11	37	89	30	174
principles of ecology	3	4	5	15	51	16	94
endangered species	0	0	1	0	0	2	3

TABLE 5.10: RESOURCES

Level	Ent-J2	S1-2	S3-4	F1-2	F3-4	F5-7	Total
renewable/non renewable	0	0	0	0	4	0	4
personal use	0	0	0	4	5	2	11
global use	0	0	0	0	2	1	3
sustained yield	0	0	0	0	0	1	1
extraction/processing	0	0	0	17	13	10	40

TABLE 5.11: PEOPLE AND LIFESTYLES

Level	Ent-J2	S1-2	S3-4	F1-2	F3-4	F5-7	Total
NZ lifestyles	1	0	1	33	41	7	83
Polynesian lifestyles	2	0	11	4	29	2	48
other societies	5	3	2	41	41	16	108
concern/conflict	3	0	4	9	76	13	105

TABLE 5.12: ENERGY AS A RESOURCE

Level	Ent-J2	S1-2	S3-4	F1-2	F3-4	F5-7	Total
finite nature	0	0	0	0	2	0	2
NZ's resources	0	0	0	0	2	0	2
conservation	1	1	1	0	0	0	3
alternative sources	0	0	1	0	8	0	9

TABLE 5.13: AESTHETICS

Level	Ent-J2	S1-2	S3-4	F1-2	F3-4	F5-7	Total
urban aesthetics	0	0	0	0	0	24	24
natural landscapes	0	0	0	4	2	0	6
design/life quality	0	0	0	0	5	4	9
cultural aesthetics	0	0	1	1	0	0	2

groups. These discussions were undertaken first, as a courtesy to teachers who had volunteered to take part in the study, and second, as a way of obtaining teachers' judgements of what the results meant. Much of each discussion was devoted to exploring the problem of cognitive dominance - its causes, consequences and remedies. The contributions made by teachers during these discussions were both sincere and perceptive. In two cases, discussion continued for several hours.

Teachers were taken through the results and the interpretations that I placed on them, largely as they have been presented here. They were invited to consider the implications of the study and their discussion was recorded, usually without further prompting.

Cognitive dominance. The extent to which cognitive interpretations dominated our results was pointed out to teachers. They were invited to comment on why this was so. Some of their reasons were:

1. Process teaching is not what teachers are paid to do.

While no teacher used the words above, it was evident that many teachers, and secondary school teachers in particular, saw their central task to be the teaching of facts and skills. Responses such as, "It's not our job"; "There isn't enough time"; or, "That's not what the syllabus requires", suggested that teachers saw process teaching as peripheral, dispensable, or the icing on the cake.

2. Lack of training in classroom methods for process teaching.

One teacher suggested during discussion that most teachers did not know how to teach for process

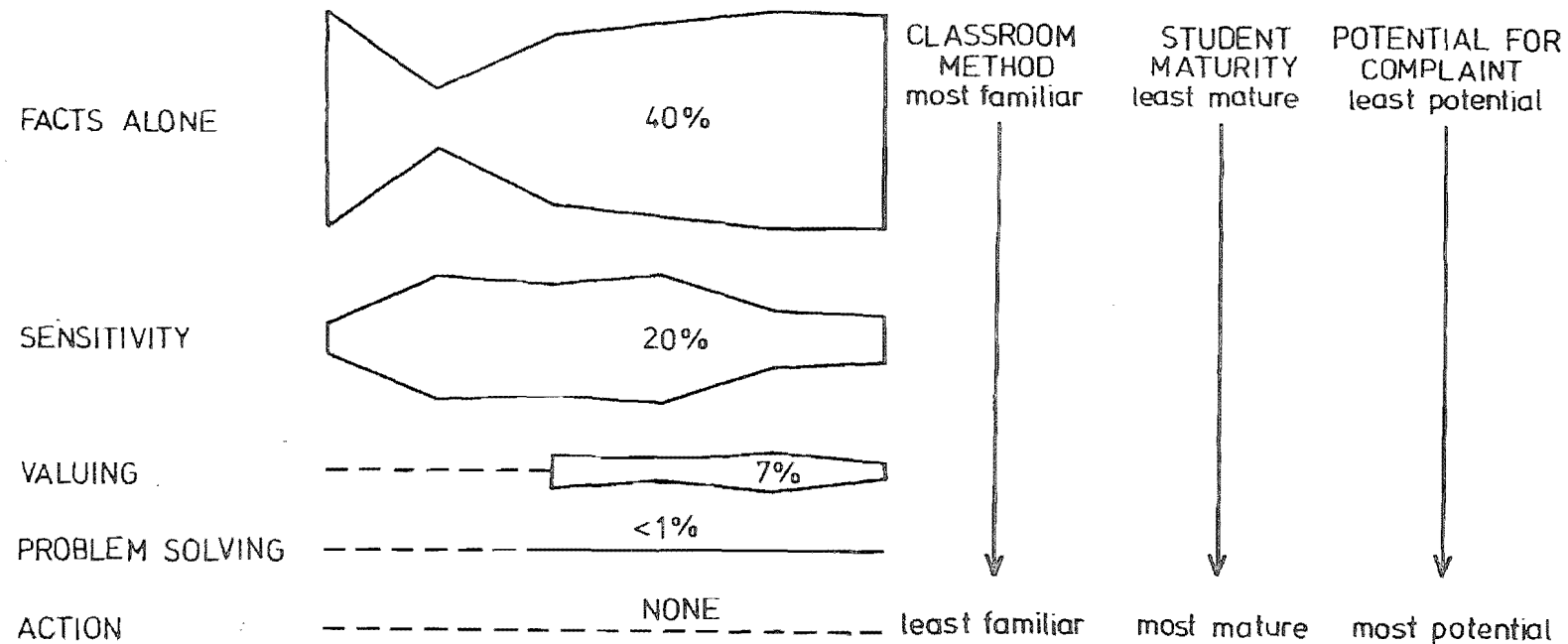
goal. Several other teachers made the same point during private discussions. One requested that I quote him on the matter. Other responses - such as the suggestion that students' lack of maturity precluded valuing, problem solving and action - also suggested that teachers lacked classroom methods.

3. Possible complaint from parents.

All staff groups raised the possibility that attention to real issues and conflicts in the classroom might create repercussions for the school. Teachers believe that there were limitations upon what could be addressed in the classroom but they had no common understanding of what those limits were.

During one of these discussions with teachers the idea emerged that the five elements of environmental education - content, sensitivity, valuing, problem solving and action - can be placed on a continuum, in that order, with respect to three particular constraints (Figure 5.4). One staff group believed, with some conviction, that this explained their relative frequency in these results. Another staff group singled out the same three reasons for teachers' emphasis on cognitive interpretation. 'Content only' teaching about the environment was most familiar to teachers, required least maturity in students and had the least potential for provoking complaints from parents. Action strategies, on the other hand, were least familiar to teachers, required the greatest maturity of students and had the greatest potential for conflict with parents. Sensitivity development, valuing and problem solving could be placed in between these two extremes, in the same order as their frequency in our observed classroom curriculum.

FIGURE 5.4: Some teachers saw the pattern of results obtained (left hand column) to be the product of differences in familiarity with teaching method; the level of student maturity required; and the potential for complaint from parents.



5.53 EVIDENCE FOR RELIABILITY AND VALIDITY

Theoretical aspects of reliability and validity are dealt with in Section 5.31. The significant point to emerge here is that the demonstration of both of these properties in an observational study can be a complex matter. Medley and Mitzel (1963) suggest that the key point is whether the measurement process had sufficient reliability for the purpose for which it was used. A similar point might well be made to do with validity. Given the nature of this study, which is descriptive rather than experimental and deals (very largely) with easily recognised events, validity is a more necessary criterion to establish than is reliability. In other words, it is more important to demonstrate that what was being sought and recorded truly was environmental education than it is to demonstrate that counts were being made in a consistent and objective manner.

Unfortunately, validity is a difficult quality to demonstrate in studies of teaching (Herbert and Attridge, 1975). Those aspects of the present study that provide support for the proposition that the study has an adequate degree of validity are as follows:

- content validity is indicated by a comparison of both the theoretical model (Figure 5.1) and the listing of elements (Section 5.41) with the discussion of principles of environmental education in chapter two. All of the aspects of environmental education developed there are represented in the model, the listing of elements and the research instrument;
- construct validity is indicated by the logical support for the theoretical model which underlies the instrument; and,

- face validity is indicated by the acceptance of the list of elements of environmental education by both a panel of disciplinary experts and the Curriculum Development Division of the Department of Education.

Two aspects of the data presented here suggest that the study has an adequate degree of reliability. These are the coefficient of observer agreement scores and the high degree of internal consistency within the observational data. The COA scores returned by the observers during training (Figure 5.2) reached a team average of 0.9 (on a scale from 0 to +1), which is high by ordinary standards (Medley and Mitzel, 1958). This statistic suggests that the combination of observers and the research instrument were together identifying and categorising elements of environmental education with a high degree of objectivity and precision (Medley and Mitzel, 1963). COA scores were not continued into the classroom programme. However, the high degree of internal consistency in the data returned by the team (Figure 5.3) suggests that the objectivity and precision of the observations continued throughout the programme in the classroom.

5.6 DISCUSSION

The methodology developed for this study of the classroom curriculum in environmental education appears to have worked adequately. Observers had no difficulty in identifying and classifying instruction in environmental education. There is evidence that the study possessed an adequate degree of both reliability and validity. Trends in the data are consistent and suggest that real phenomena were being observed and recorded in a

consistent way. The loss of nine weeks of observation time because of difficulties with teacher unions resulted in a loss of detail in the picture of existing practice. Nevertheless, the results that emerge as having significance from a policy point of view are general findings rather than matters of detail. Fortunately, therefore the study retained much of its value.

The general findings from this study that have implications for the further development of environmental education in this country have to do with both the written curriculum and the classroom curriculum. It is convenient to review them under those headings. Principal features of the written curriculum are: that it retains a strong interest in environmental themes, which is reflected in numerous opportunities to develop environmental education; that the resulting existing infusion curriculum is rather unco-ordinated and haphazard; that the area of decision making is not covered at all by existing curriculum statements; and, that existing curriculum statements tend to encourage and even require cognitive treatment. Principal features of the classroom curriculum are: that there is a great deal of instruction ABOUT the environment; that the treatment of environmental topics is dominated by cognitive teaching; that teachers appear to lack the pedagogies needed for non-cognitive environmental education; and, that teachers see the non-cognitive elements of environmental education as falling outside societies' expectations of the school. Each of these principal findings is further discussed below.

5.61 THE CURRICULUM AS IT IS WRITTEN

With one significant exception the existing written curriculum provides many opportunities for the

development of environmental education. The exception is the area of decision making, which is further discussed below. All other major elements of environmental education can be developed within the existing curriculum structure. Two qualifications should be added to this conclusion. The first is that the existing formal curriculum nominates topics that a teacher may elect to develop through environmental education approaches much more often than it nominates an environmental education approach. In other words, the curriculum offers opportunities for environmental education but it does require that those opportunities be developed in that way. The second qualification is that this existing infusion curriculum is the product of accidental arrangement rather than deliberate design. It therefore lacks any obvious themes of the kind outlined in the conclusion to chapter four, or any degree of co-ordination. Nevertheless, the existing formal national curriculum does not emerge as an initial barrier to progress.

The one area in which the existing national curriculum fails to provide adequate opportunity for the development of environmental education is in the area of decision making. This was defined as largely cognitive studies of how our society manages its environment and how individual people can influence the management process. It can be regarded as an environmental form of civics education. The New Zealand environment is managed by a wide range of authorities, tribunals, commissions and committees. The result is a particularly complex administrative structure. Nevertheless, it is remarkable that, according to the results presented here, students leave school without ever learning about such key aspects of civic and environmental administration as; the

district scheme, water rights, environmental impact reports and the Planning Tribunal. At no stage does the school appear to prepare students for the practice of preparing and presenting submissions on environmental matters, or on civic matters of any kind.

Curriculum structure appears to be the reason for the almost total lack of instruction to do with decision making. There is no direct reference in any written curriculum statement to topics of this kind. Subject experts in Social Studies suggest that some attention used to be given to local government, but that these topics were now optional and rarely taught.

An important result of this lack of attention to environmental decision making is powerlessness. While individuals within society remain unaware of due process, and unskilled in its use, they can be disadvantaged when matters affecting their welfare are being decided. The philosophy of environmental education outlined in chapter two emphasises the role of education in ensuring that individuals are able to represent themselves adequately in matters affecting their welfare.

Other less significant deficiencies in the existing curriculum are the result of the academic approach that the curriculum takes to topics characteristic of environmental education. In particular, three important themes are inadequately treated. These are as follows:

- the biologically unique nature of New Zealand. New Zealand is a biologically unique country with large numbers of endemic species. As a primary producing society it is inevitable that natural landscapes have become heavily modified, habitats reduced and species rendered extinct or endangered.

No written curricula, in particular, stress the teaching of principles and facts to do with theoretical biology;

- the fundamental nature of energy as a resource. Energy is necessary for the location, extraction, processing, fabrication and distribution of all other resources. Societies have access to all resources in proportion to their access to fuel energy. The existing science curriculum uses energy themes to integrate the curriculum as a whole, but pays little attention to energy as a resource. In Social Studies the curriculum specifies more traditional topics to do with the extraction and processing of resources; and,

- the finite nature of all stock resources and their allocation between present and future people. New Zealand has a more limited base of physical resources than most societies. Questions to do with the purposes for which available resources are developed and the rate at which they are used, are more significant. However, no substantial curriculum opportunity exists for the exploration of topics of this kind.

5.62 THE CURRICULUM AS IT IS TAUGHT

The central finding of this study is that there exists a substantial curriculum of cognitive environmental education in the existing classroom curriculum. The domination of classroom teaching about the environment by content was most evident in the Secondary School. At this level content accounted for more than 80% of all instructional events in environmental education. It was least evident at intermediate level. One major

implication of the cognitive approach to environmental themes was that environmental problems were dealt with at a purely factual level. Little or no attention was given to feelings, beliefs, solutions or actions.

The clear implication of the existing pattern of events is that change in existing classroom practice required by environmental education will be particularly difficult to bring about. That difficulty stems from the fact that the required changes fall squarely into the territory identified in chapter three as the culture of the classroom. Culture is considered to involve agreed purposes and shared understandings that bind participants to familiar ways of proceeding. Within the classroom, individuals are bound by their shared culture. Within the school, classrooms are bound by agreed ways of proceeding. Environmental education will require changes to both the purpose of classroom teaching and to the methods by which it is advanced. In chapter three I have argued that purpose and method are the most fundamental and therefore the most inert aspects of the culture of the classroom. Therefore, the further development of environmental education in New Zealand faces what I will call a 'purposes problem' and a 'methods problem'.

The 'purposes problem' has to do with what teachers believe the purposes of schooling to involve. Included within that is what teachers judge society to believe about the purposes of schooling. Many teachers made it clear that they saw the more fundamental elements of environmental education as being too radical or in some other way outside the accepted view of schooling. In particular, their concerns focussed on two areas. The first involved teaching about issues over which there were significant divisions in society. The second

involved the notion of students taking remedial action. In some cases the judgement was personal. "I do not believe my job includes that kind of teaching". In other cases, the judgement was made on behalf of society. It was notable that all groups of teachers with whom I discussed the results - primary, intermediate and secondary - all judged these elements of environmental education to require more maturity than their students had. Our students, it was suggested, are not ready for that kind of education.

The methods problem has to do with the way in which student activities are organised for the achievement of non-cognitive learning goals. In particular, the approaches to valuing and problem solving were not well developed. From the stand-point of environmental education the valuing involved superficial topics superficially treated. The superficiality of topics had to do with the purposes problem described above. (Schools do not engage in controversy). The superficiality of treatment may well stem from the fact that most valuing was seen during Language/English lessons. Here the teachers' primary purpose appeared to involve the development of communication skills. A class discussion about some topical issue was a good way of starting the lesson. The values conflict appeared to be a means to an end, rather than an end in itself. In junior secondary Social Studies the social issues was more likely to be the focus of the lesson. For the most part, however, the treatment of values conflicts in Social Studies did not differ from that in Language/English. In four lessons out of the 228 observations recorded of junior secondary Social Studies, valuing involved at least four of the five categories on the research instrument. In the remaining 224 lessons

there was nothing more than class discussion.

So few lessons were seen involving problem solving that generalisations about method are not warranted. However, it is worth noting that in the nine problem solving lessons recorded, there was no consistent method.

This study of existing practice was constructed around a model of environmental education which started with the introduction of an environmental problem and ended with remedial action. In between, the definition placed a series of optional steps, including sensitivity development, valuing, cognitive learning, decision making and problem solving. Evidence for the use of these pedagogies was then sought in a group of typical New Zealand schools. The picture of the New Zealand school portrayed in the results of observations is that of a conservative institution devoted to tradition academic enterprises.

As a result of conservatism and academic approaches, the many curriculum opportunities for the development of environmental education are developed in a particular way. First, the more 'radical' elements of environmental education are precluded by the conservative nature of the school. Thus few genuinely controversial issues were observed and no action strategies were seen. Second, valuing and problem solving, which are increasingly specified in newer curricula such as Social Studies, are departures from the intentions of traditional academic education. It seems unreasonable to expect the classroom to become another kind of cultural system for 45 minutes each day while Social Studies is taught. Teachers consider themselves untrained in the use of valuing and problem solving pedagogies. The argument developed in

chapter three suggests that even if individual teachers were given appropriate training, they would find it difficult to integrate process teaching into schools dominated by a competing kind of education.

Finally, decision making falls to the fact that it is a kind of environmental 'civics' education. Civics education is not a traditional academic topic within New Zealand education. Thus the written curriculum was found to provide no opportunities for decision making. The only major element of environmental education that is permitted by the combination of conservative social expectations of the school and a curriculum rooted in academic education is cognitive learning. And that is what this study found in abundance.

CHAPTER SIX

POLICY IMPLICATIONS

There is a characteristic impulse in our society to turn to education to solve complex social problems... While this source of support can only be welcomed, some hard questions should be raised by the expectation that our schools can achieve..[this kind of] social goal.

Edward Ames, 1971

[Environmental education] has not been able to be implemented in school curricula in its full meaning and indeed could be said to have been neutralised through incorporation into the existing hegemony of Australian education.

Greenall, 1981

6.1 INTRODUCTION

In the introduction to this study I indicated that its principal purpose was to examine aspects of environmental education that have implications for educational policy. New Zealand has no formal programme in environmental education. However, there has been both increasing interest in the development of a response and uncertainty about the form that response should take. Therefore, this study has addressed a number of key questions that have a bearing on what should be done in this society at this time in the name of environmental education.

The word 'policy' is one of the battered infants of the english language. I am probably going to do more deeply regretted mischief to it here. 'Policy' can mean everything from established practices that are inviolate because of their entrenched nature, to an expression of broad intentions for the future (Harman, 1984). 'Policy' is also used here with some breadth of meaning. I take it to include statements of socially desirable educational goals and best ways of moving towards them (both in relation to school based environmental education). The territory of 'policy' I see as falling between the philosophy of environmental education (at the top) and specific curricula, programmes and materials, which I regard as the principal products of environmental education policy.

The first chapter of this study introduced four questions which I considered to frame the policy implications of school based environmental education at national level. Those questions were:

QUESTION ONE: What exactly is environmental education? Numerous variations of the central theme of environmental education have caused much confusion about its nature and working methods. There is evidence that the 'real thing' is still too abstract and requires translation into the language of curricula and classrooms.

QUESTION TWO: What are the implications for environmental education of present understanding in the field of curriculum studies? The fate of new ideas in education have been examined in many studies. Researchers have attempted to identify factors that contribute either success or failure to efforts to change

what teachers teach. There are substantial implications in their findings for environmental education.

QUESTION THREE: What are the environmental issues and problems that should be the basis of a New Zealand programme? Properly understood, environmental education involves a set of environmental problems with national relevance and a pedagogy for approaching them in a problem solving way. Environmental education must therefore be 'fitted' to national environmental and social circumstances.

QUESTION FOUR: What aspects of existing educational practice in New Zealand contribute to the intentions of environmental education? Just as environmental education should be fitted to prevailing national environmental and social circumstances, so it should also accommodate existing educational practices.

These four questions were each examined in separate studies, in chapters two through to five.

The significance of the results for educational policy can be found at two levels. First, there are the results of the individual studies, each of which contributes understanding to what needs to be done. However, a second and more significant set of implications for policy can be found in the relationships between individual sets of results, which are both complementary and mutually supportive. Therefore, the remainder of this chapter is set out as follows: First, the results with policy implications are introduced from the individual studies, in section 6.2. Then section 6.3 introduces a cross-disciplinary synthesis of the individual studies. Finally, section 6.4 examines policy options for the development of environmental education in

New Zealand.

6.2 RESULTS OF INDIVIDUAL STUDIES

The nature of environmental education.

Chapter two examined the development of the concept of environmental education during the two decades since its inception. Two developmental phases were identified - pre- and post-Unesco/UNEP.

In the years before the U.N. programme, American environmental educators developed a philosophy centred around problem solving in human ecology. Their conceptual arena was bounded by the topics of population, resources, environment, social justice. Arthur Lucas (1972) neatly summed up the difference between 'real' environmental education and other teaching to do with the environment in the following way: He suggested that education can be IN the environment (outdoor education; field studies), ABOUT the environment (ecology, geography), or FOR the environment. Environmental education is FOR the environment in that it addressed real-world problems in a problem solving way.

The Unesco/UNEP programme placed the American philosophy of environmental education in a global framework. The major component parts of American environmental education, as they are defined in section 2.22, were retained and re-emphasised. However, there was a marked change to the scope and nature of the problems to which environmental education was to be directed. The Belgrade charter defined a framework for environmental education

in which the needs of global social justice were of central concern. The charter added to the issues in human ecology a number of concerns about economic and political questions to do with the distribution of the world's available resources.

Throughout both phases of its development environmental education has shown two contrasting characteristics: On one hand rapid spread and enthusiastic uptake, and on the other widespread uncertainty about conceptual and methodological issues. There were two sources of the conceptual confusion. First, the pre-Unesco/UNEP phase of development involved widespread spawning of variations on the original concept. Some early variants had little in common with 'real' environmental education except name. Lucas (1980) has suggested that a number of those false models continue to exist, together with their associated instructional materials. The key point about these variants is that they deliver to teachers the wrong message about the intentions of environmental education.

The second source of conceptual uncertainty has to do with the way educators responded to the message of environmental education. Assessments by Lucas (1980) and Greenall (1981) of post-Unesco/UNEP programmes suggest that even when the 'correct' message was available to teachers, their response normally has been to translate it back into more familiar ways of doing things. The progressive process elements of values change, problem solving and action were replaced by the traditional emphasis on cognitive material. Education FOR the environment typically was translated into education IN or ABOUT the environment. The available course assessments suggest that even when teachers received a correct

message concerning the nature of environmental education, they implemented something else.

The process of curriculum change.

Chapter three introduces a discussion of the process of curriculum change. From the point of view of educational policy the most significant finding there is that externally planned curriculum change should be approached as haphazard and fraught with difficulty. It is normal for innovations in education to be either ignored or adapted by schools. In the most general terms, the degree of resistance to change depends upon the features of classroom instruction that is to be modified. Three levels of response can be identified. Changes to the content of classroom teaching are accommodated more readily than changes in teaching process. Resistance to change is greatest when what is proposed in a new culture for the classroom - a new view of what education is about, with new roles for the school, the teacher and the student.

There is evidence that the content of classroom teaching can be influenced successfully by well designed teaching materials embodying the innovation. If an innovation is offered that involves change to both the content and process dimensions of the classroom, (some of) the content will be taken up and adapted to existing process approaches. The essential nucleus of a teacher's process is particularly resistant to change. However, there is some evidence that a degree of change in teaching process can be brought about by properly conducted re-training of teachers. However, the stability of teaching methods in the traditional classroom against fifty years' of attempted

change suggests that there may be strong reasons for established practices.

The fate of attempts to change the culture of the classroom are also illuminative. The available evidence suggests that change of that kind is resisted by a wide range of groups including parents, pressure groups, the school itself, the educational bureaucracy, even government. In Australia, Annette Greenall has reported that a radical environmental education curriculum 'action plan' was side-tracked by the educational bureaucracy (Greenall, 1981). Barry MacDonald (MacDonald and Walker, 1976) has reported that teachers who trained in and taught the Humanities Curriculum Project became an elite, isolated from their peers and subject to pressure to conform. The school sought to protect established role-relationships. The H.C.P. also engendered a bitter public wrangle as groups within society sought to resolve their differences over a new view of schooling. Gerome Brunner's MACOS resulted in court action. To paraphrase Donald Schon, the metaphor for the transmission of a substantial innovation is not diffusion. It is battle.

Information assembled in chapter three also suggests that the characteristics of educational change are no more than a special case of social change. Several views of the dissemination and uptake of change in relation to social systems are outlined (Rogers and Shoemaker, 1971; Rogers, 1983; Havelock, 1971; Schon, 1971). These studies present overlapping perspectives of the events in the social change process. The major points of relevance

are that:

- schools appear rather more resistant to change than other subcultures within our society. Once again, it is implied that there may be strong reason for present practices;
- the model for change that involves a centrally-planned, generalised innovation being passed radially to users is most prone to failure. The greater the attention given to the innovation, and the less the attention given to the user system, the more likely the failure;
- social systems have at their nucleus a set of existing cultural practices "around which they are organically built" (Schon, 1971). An innovation touching this heartland threatens the system's culture as a whole. It will be resisted, if necessary by force; and,
- social attributes of a system influence the uptake of innovations. Relevant factors include the distribution of opinion leadership within the group, its norms (which includes user needs) and communication networks.

A number of studies presented in chapter three examined the factors that influenced the uptake of innovations by schools. Those studies suggested that, in addition to the general forces working between innovations and schools (as above), there are two significant, localised phenomena. These are first, the amount of disruption implied by the innovation to the teacher's primary occupational goals of class control and achievement. In order to satisfy simultaneously the requirements of class control and achievement, some teachers make extensive use of instructional methods called coping strategies

(Westbury, 1973). Innovations that require the abandonment of coping strategies will be resisted. I consider this to be a major source of resistance to process change in schools. The second localised barrier to change involves the common failure on the part of course developers to communicate to teachers the full range of changes required by the innovation. With respect to obscure innovations several studies suggest that the more complex the innovation and the more limited the communication, the greater the re-invention. Schools deal in simple ideas.

Environmental problems and environmental education.

In chapter four I examined several questions associated with the notion of 'environmental problems'. After Belgrade, there has been some confusion about the nature of environmental problems for environmental education. Three matters were explored in chapter four. The first was an attempt to identify by defensible means the environmental problems that should be given focus in a New Zealand programme. I have referred to this as the establishment of a national framework, which was likely to be too complex for classroom use, but which would provide direction and identify priorities. The second matter was the formulation of a curriculum-like, classroom language, 'content definition' which would allow for vertical and horizontal integration of learning experiences around problem themes instead of around disciplinary content. The third objective was to test for the presence of, and if present examine the nature of, the world-view or paradigm that gives rise to problem statements characteristic of environmental education. Methodologically, the three matters to do with the nature of 'environmental problems' were approached through a

social survey of expert environmental managers.

A national framework is presented here in the form of 46 problem statements (Appendix 4C). I regard these as the raw material from which a national programme is hewn, just as a conventional programme is built out of disciplinary facts and principles. There are two significant aspects of the national framework identified here. First to a large extent, it endorses the global framework proposed in the Belgrade Charter (Appendix 2A). Second, it extends the major dimensions of the Belgrade framework to national level. Each of the major problem themes of the global framework, like social justice, exists also within New Zealand. The two dimensional nature of the national framework is captured in the content definition proposed in section 4.53.

However, I regard as most significant the (tentative) discovery of a paradigm behind the judgements characteristic of environmental education. That paradigm is in the nature of a set of moral beliefs emphasising our responsibility to avoid creating consequences for three groups of 'other' - other societies (other present people), future people and non-human species. Present people are expected to show greater restraint, to make sacrifices, for the benefit of these disadvantaged others. All of the aspirations of the discipline environmental education are encapsulated by this simple ethic. It represents in a most fundamental way the essence of the philosophy of environmental education.

STATEMENT: The increasing number of married women entering the workforce creates a number of social costs. The number and quality of jobs available to men is reduced. An increasing number of men, who are the head of their household, are unemployed. An unemployed man is without honour and will be subject to moral decay. The children of employed women are left without proper care and guidance and are also subject to moral decay. Our society was stronger, happier and more moral when married women accepted that their place was in the home.

Clearly, social concerns of this kind are not within the domain of environmental education! However, problems of this kind can be ruled out only by explicit acknowledgement that environmental education is about only certain kinds of problems. Those 'right kinds of problems' have in common an ethical basis.

The setting down of an underlying ethic makes it possible to clarify two aspects of environmental education. Environmental education can be regarded as consisting of a moral rudder (to provide direction), a set of nationally-relevant environmental problems and a problem solving pedagogy (with which to make headway). An 'environmental problem', which post-Belgrade is something that puzzled teachers because it is no longer an obvious concept, can now be defined as a situation in which our culture transfers some significant disadvantage to other present people, to future people or to non-human species.

However, the finding that environmental education is about the promulgation of certain beliefs leads to two dilemmas. The first is whether or not the ethic of environmental education is part of the broad social ethic that society expects schools to impart. If it is not, then it requires sanction before it can be added to the moral agenda of the school. The second, and rather more immediate question, is whether this kind of education is feasible. We need not spend our time debating whether schools ought to inculcate the ethic of environmental education if it is beyond the capabilities of present classrooms to achieve objectives of this kind.

I take the view that we should be most cautious about assuming that schools are able to change students beliefs and values. This topic could be pursued at considerable length, but I will do no more than introduce two perspectives on it. One of my students, Barbara McKay, attempted to measure the changes in students' beliefs that resulted from outdoor education experiences in wilderness environments (MacKay, 1981). The experiences had been designed by teachers to enhance students' attitudes to nature and nature conservation. All of the teachers involved in the study believed implicitly that student beliefs were changed. Both psychometric and illuminative methods of evaluation were used by the researcher. The study found significant movements in students' personal values about nature, but in both positive and negative directions. At class level gains and losses tended to cancel out. A particularly good trip might leave some residual positive effect; a particularly bad one might leave the reverse.

Lawrence Stenhouse has recorded a similar caution about attempts to change values through environmental education (Stenhouse, 1977):

I believe I can predict the effects in the affective and attitudinal areas: my hypothesis is that in any representative sample of schools some will move mean scores in one direction, and some in the other. There is not likely to be any teaching of environmental education which does not, in some schools, make mean scores on attitude toward the environment deteriorate. I would further suggest that within any one group of students there is unlikely to be any kind of teaching which does not make some of those students' attitudes deteriorate - because of rejection of schooling, resistance to the situation, or just entrenchment and living in a home where parents take extremely cynical attitudes toward environmentalists.

Existing classroom practice.

Finally, chapter five examined the nature of existing teaching to do with the environment in an observational study of several schools. An instrument for classroom observation was developed out of the process and content models of environmental education presented in chapters two and four respectively. More than 1300 lessons observations were collected from all levels from J1 (five years of age) to F7 (17 years of age). An analysis of the written curriculum accompanied the study of classroom teaching.

The results of classroom observations identified a substantial curriculum ABOUT the environment, both in the classroom and in formal national curriculum statements. Almost 60% of lessons observed contained instruction capable of being described as environmental educational. However, two thirds of those positive observations involved cognitive elements alone. The important process elements of environmental education - values clarification, problem solving and action - were seen in around 10% of lessons. The majority of those positive results consisted of limited class discussions about uncontroversial social and/or environmental topics. Teachers appeared to lack classroom methods with which to develop valuing and problem solving. The written curriculum provided almost no opportunities for decision making. Teachers expressed reservations regarding the introduction of controversial issues into classroom instruction. They expressed stronger reservations regarding action strategies, which they saw as being not part of accepted views of the purposes of schools. In debriefing discussions with teachers I was struck by the extent to which they imposed limitations on their own teaching on behalf of what they saw as societies' wishes. The result of self-imposed limitations, methodological weaknesses and curriculum constraints was a pattern of environmental teaching dominated by academic concepts.

The model of environmental education developed in this study requires a pattern of classroom teaching that is high in process, low in content and involves a willingness to consider controversial issues in the classroom. When the results of classroom observations were disaggregated into subject and/or level totals they suggested that the desired pattern was best developed in

English/Language and at intermediate school level. In neither case did the pattern of teaching bear any close resemblance to that required by environmental education. It was simply less content dominated and involved some deeper exploration of more controversial issues.

Conversely, the pattern of teaching was least like that required by environmental education in Science and at secondary school level. The secondary school was increasingly dominated by content with advancing level. Science teaching was the least environmental education like of all the core subjects, being devoted almost exclusively to the teaching of content and science skills. The observers noted many times in science lessons the extraordinary phenomenon of lessons about scientific dimensions of environmental problems that contained no mention or implication that the subject of the lesson was in any way problematic or undesirable.

6.3 CROSS-DISCIPLINARY PERSPECTIVES.

Evidence presented in chapter two of this study supports the view that the dissemination of environmental education often fails. There appears to be fault with both the current model of the nature of environmental education and the current approach to the dissemination of that model to users. I take the 'current model' to mean the Unesco/UNEP specification for environmental education, together with the attendant framework and implied pedagogies.

On the basis of the total set of ideas introduced in this study there appears to be four difficulties with existing practice:

The communicability of the Unesco/UNEP model;

The viability of the model, on two grounds. First, the impact of its extremely progressive philosophy on our (very) conventional classrooms. Second, the reality, or lack of it, of values change in the classroom;

The dissemination of the model, again on two grounds. First, R, D and D doesn't work. Environmental education is perhaps the ultimate in centrally-planned innovations in education. Second, the widespread use of science as a vehicle for environmental education; and

The social acceptability of the purposes of environmental education.

Each of these is further discussed below.

I consider the communicability - or more correctly, the lack of communicability - of the Unesco/UNEP model to be an important aspect of present difficulties. The implementation studies reviewed in chapter two suggest that obscurity is an important contributor to the failure of curriculum innovations. There is clear evidence that complexity leads to re-invention. There is also clear evidence that obscurity leads to re-invention. The current Unesco/UNEP model is both complex and obscure. Simplification and translation through to the language of

the school are required.

There are at least two reasons for questioning the viability of the current model itself. The first is that the model is very progressive. It emphasises process learning, student-led investigations and action. The results of the observations of existing practice in chapter five suggest that the New Zealand classroom is by marked contrast, very traditional. Instruction is dominated by teacher and by content. Process teaching of the kind required by environmental education is weak or non-existent. The change to the N.Z. classroom required by the present model of environmental education goes beyond change in content alone, or content and certain process elements. It requires a new kind of classroom culture. The establishment of a new culture of education is a most uncertain enterprise. Not only does it require fundamental change to the way in which the business of the classroom is conducted, but it may also be an all-or-nothing change.

In practical terms it is difficult to foresee an approach that would permit classrooms to become student-centred, enquiry-centred, progressive cultures during environmental education lessons, only to revert to the conventional form for other instruction. Similarly, it is difficult to foresee the survival of a progressive classroom in an otherwise conventional school. Derek Morell (1965) has written that:

.. adult procedures in the classroom.. will not be successful if a different kind of relationship between teacher and pupil obtains in the corridor or in extra-curricular activity. If the teacher

emphasises in the classroom his common humanity with the pupil and his common uncertainty in the face of many problems, the pupils will not take kindly to being demoted to the status of children in other relationships within the same institution.

The extent to which a school has developed a progressive classroom culture may be a fundamental constraint upon the kind of environmental education that can be introduced.

The second reason for concern about the viability of the model has to do with the reality (or lack of it) of values change in education. Chapter four suggests that environmental education is moral education. There are good reasons for suggesting that ordinary classroom instruction does not bring about planned change in student beliefs. There are a number of philosophical and methodological problems to be worked out here.

The third area in which present approaches are failing has to do with the dissemination of the model to teachers. It is now widely accepted that centre-dominated change models do not work.

The more the emphasis during development falls upon perfecting 'the innovation' and the more limited the attention to the implications of the culture of the user, the greater the dissemination failure. Environmental education stands as perhaps the ultimate in R, D and D. An internationally perfected innovation has been passed radially to user states, with no apparent regard during development for classroom culture or user needs in implementing societies.

The second aspect of present dissemination called into question by the results of this study is the widespread use of science education as a vehicle for environmental education. In the studies of existing practice reported here, science was the least process oriented, least concerned with controversial issues, most content-dominated and therefore the least environmental-education-like of any curriculum. On the basis of these results, one would select science as a vehicle for environmental education if one sought a purely cognitive curriculum. The culture of the science classroom is built around the manipulation of facts and principles. By its very nature it is not easily compatible with the culture of environmental education. The unsuitability of science increases with advancing school level. Teachers of science, who are part of the great edifice of science, will not easily change their culture.

The fourth area in which the present model of environmental education raises significant questions has to do with socially accepted views of the purposes of schooling. One of the most significant characteristics of education as a social system is the large number of actors who hold power in relation to what schools do. Those power groups include the Minister of Education and senior Departmental Heads (together the most powerful of all) members of caucus, local Departmental officials, school boards and committees, school principals, parents in general, parent pressure groups, teacher unions, subject associations, political parties, academics and the media (Harman, 1984). The net effect is that veto power is widely distributed. Innovations that are more than relatively minor alterations to the status quo must

be widely and carefully negotiated if they are not to be vetoed, perhaps in a blaze of indignant publicity.

The standard model of environmental education proposes marked changes to the purposes of schooling. In chapter three, the difficulty and controversy associated with that degree of change was outlined. In chapter five the New Zealand classroom was seen to be superficial and conflict-avoiding in relation to controversial issues. Controversial issues had no place in the classroom because someone might object. I was struck by the way teachers adopted a 'heads down for safety' posture in relation to the content of classroom education. The greater number of N.Z. teachers are not interested in innovations that may prove controversial.

6.4 IMPLICATIONS FOR POLICY AND PRACTICE

It seems clear enough that one ought not to propose educational agendas for schools that cannot be realised in the classroom. The ideas introduced in this study lead me to the conclusion that not enough has been done to hew from the 'grand scheme' of the Unesco/UNEP model for environmental education, a simple, implementable, demonstrably successful curriculum strategy. The four key areas requiring attention are those discussed above - communicability, viability, a dissemination model and social sanction. I will briefly develop the policy implications of each of these. Before I do, however I wish to take up a matter that applies to all of them. That is, the pace of change.

In most cases, environmental educators have had as a goal rapid, wholesale change to what schools teach. They have sought the simultaneous infusion of environmental education approaches across the entire school age range. My argument here is that such revolutionary change exacerbates problems to do with dissemination and implementation. A change model more appropriate from the point of view of both school and society is that of evolutionary development in the form of a regular flow of small innovations. For example, Lucas (1980) has reported that a proposed school curriculum in environmental education was rejected by South Australian educational authorities. At about the same time in the state of Victoria authorities approved the changing of an Agricultural Science course to Agricultural and Environmental Science. Later, approval was again given for changing the same Agricultural and Environmental Science course to Environmental Science.

In addition to making the development of environmental education more socially acceptable, an incremental approach provides opportunity to work through in a New Zealand setting the policy issues outlined previously.

Of the four policy issues outlined above, two can now be dealt with quickly. First, environmental education requires social sanction as an activity appropriate for New Zealand's national school system. This in turn requires a political decision. Second, the communicability of environmental education has been addressed in this study. I have proposed a national framework, a 'content' definition and a process definition which together have proved successful in introducing teachers to the concept of environmental

education.

The third issue with policy implications is that of the need for a new dissemination model. In Everett Rogers's terms, there is a need to bring client centred issues into the realm of the innovation in addition to bringing innovation centred issues into the client system (Rogers, 1983). One model considered capable of achieving this is what Ronald Havelock (1971) calls the S.I. approach.

The S.I. model is a 'humanised' R, D and D (section 3.35). It allows a centrally-managed doctrine. However, its communication to potential users pays careful attention to social factors within the user group and to stages in the process of cultural change. It is not a model for large scale change. It implies highly trained tutors and successful adopters working together in occasional, but prolonged, contact with some natural grouping of potential users. Such a group might best be an individual school. The school as the unit of change has two significant advantages. First, adopting teachers are not isolated from their peers by the innovation and second, the milieu of the school supports change rather than opposing it.

Finally, there are policy questions to do with viability. I regard these as significant and deserving of careful attention. Up to the present the environmental education programmes on which I have been able to assemble information appear to have been unsuccessful in establishing a progressive educational philosophy in a conventional school setting. The evaluation studies reported earlier suggest that directed values change does

not result from planned educational experiences. Questions about classroom methods for environmental education and about the extent to which its various objectives can be met are now urgent. It is important for all nations attempting to develop school based environmental education approaches that the present objectives are either confirmed as workable, or that a new and less ambitious model is proposed.

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